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Massachusetts Health Care Cost Trends

Price Variation in Health Care Services

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DIVISION OF
Health Care
Finance and Policy

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Executive Summary

Pursuant to the provisions of M.G.L. c. 118G, § 6 1/2, the Massachusetts Division of Health Care Finance and Policy (DHCFP) is required to conduct an annual study and hold public hearings regarding health care cost trends in the Commonwealth, and the factors that contribute to cost growth. During the 2010 health care cost trends hearings, many issues were raised related to price variation for health care services.[1] Purchasers, employers, and consumers noted that competition and market functionality are impeded when they are unaware of or insensitive to provider price differentials, and do not have complete price information available in choosing where to seek health care.[2] Such discussions echoed a fundamental principle established by the Special Commission on the Health Care Payment System in 2009 that differences in health care payments should reflect measurable differences in value (cost and quality) and should be transparent, including across different payers.[3] In the absence of these conditions, wide price differentials can persist, contributing to unnecessarily high health care costs.

In this report, DHCFP seeks to expand the understanding of price variation by examining prices paid by private health plans for commercially insured members in three service categories: inpatient hospital care; outpatient hospital care; and physician and other professional services.[4] In each category, a sample of high-volume health care services was selected to maximize comparability across providers. In addition, the prices paid by commercial carriers are compared to rates paid by Medicaid and Medicare. The report also analyzes the variation in the quality scores of hospitals for existing quality measures that can be directly related to the selected inpatient services. Lastly, the report explores the potential impact on health care spending of various models that reduce or eliminate the current level of price variation. These models are intended for illustrative purposes only, as estimated impacts are extrapolated for inpatient services and physician procedures based on a subset of high-volume services within these two groups.

1 See presentations and transcripts from the health care cost trends public hearings held March 2010. Available at: http://www.mass.gov/dhcfp/costtrends, accessed 5/22/2011.

2 One research study reviewing price variation noted that in some markets certain hospitals are so highly regarded that consumers perceive any health plan network that excludes these "must-have" hospitals as undesirable. In general, such hospitals can set higher prices. See: Paul B. Ginsburg, *Wide Variation in Hospital and Physician Payment Rates Evidence of Provider Market Power,* Research Brief No. 16, Center for Studying Health System Change, Washington, D.C., November 2010. Available at: http://www.hschange.org/CONTENT/1162/1162.pdf, accessed 5/22/2011.

3 The Massachusetts Special Commission on the Health Care Payment System developed a set of principles that were subsequently adapted to reflect feedback from numerous stakeholder groups, and reported in the Special Commission's final report. See: *Recommendations of the Special Commission on the Health Care Payment System*, July 16, 2009. Available at: http://www.mass.gov/Eeohhs2/docs/dhcfp/pc/Final_Report/Final_Report.pdf, accessed 5/22/2011.

4 Prices in this analysis include carrier payments as well as member copayments and deductible amounts.

The analyses in this report utilize data from five major health insurers who represent about 79 percent of the privately insured covered lives in Massachusetts and include both fully and self-insured claims for 2009. For inpatient hospital services, the data allows comparisons to be made at statewide and hospital-specific levels. For hospital outpatient and physician and other professional services, the price variation analysis was limited to the statewide level without identification of specific providers or provider groups. The analyses rely on a subset of services within each provider group to demonstrate the extent of price variation. For the inpatient analysis, the selected services represent 40 percent of all discharges and 32 percent of all private payer payments. For the physician and professional analysis, the subset of services represents 28 percent of services and 27 percent of private payer payments.[5]

A number of factors may influence the price of a medical service from provider to provider. The purpose of this report was not to enumerate the various factors that may influence price, nor to draw any potential correlations between all such factors and price. Rather, recent state law, Chapter 288 of the Acts of 2010, created a Special Commission on Provider Price Reform to further examine this issue.[6]

Key Findings

- Prices paid for the same hospital inpatient services and for physician and professional services vary significantly for every service examined. There was at least a three-fold difference for every service and for most, a variation of six or seven-fold.
- A comparison of median prices[7] paid across hospitals reveals that for inpatient stays such as cesarean deliveries, the highest paid hospitals receive payments that are typically more than double the lowest paid hospitals. For other services such as knee and lower leg procedures, the range is significant but narrower with payment to the highest paid hospital that is 61 percent above the lowest paid hospital.
- Data on the selected 14 routine inpatient services indicates that service volume tends to be concentrated in higher paid hospitals. For example, 47 percent of vaginal deliveries occurred in the most highly paid quartile of hospitals.

5 Due to data limitations, the services analyzed for hospital outpatient services are narrower in scope and represent only 5 percent of total hospital outpatient private payer payments. Therefore, the scope of the analysis for hospital outpatient services is more limited than analyses for hospital inpatient or physician and professional services.

6 The Special Commission on Provider Price Reform is specifically charged with examining "(i) the variation in relative prices paid to providers within similar provider groups; (ii) the variation in costs of providers for services of comparable acuity, quality and complexity; (iii) the variation in volume of care provided at providers with low and high levels of relative prices or health status adjusted total medical expenses; (iv) the correlation between price paid to providers and (1) the quality of care, (2) the acuity of the patient population, (3) the provider's payor mix, (4) the provision of unique services, including specialty teaching services and community services, and (5) operational costs, including labor costs; (iii) the correlation between price paid to providers and, in the case of hospitals, status as a disproportionate share hospital, a specialty hospital, a pediatric specialty hospital or as an academic teaching hospital; and (v) policies to promote the use of providers with low health status adjusted total medical expenses." See Chapter 288 of the Acts of 2010, § 67.

7 These calculations are based on payments after adjusting for patient severity.

- In general, tertiary care hospitals were more likely to account for a higher proportion of discharges at median prices above the statewide median than community hospitals. All tertiary care hospitals received median prices that exceeded the statewide median price for chronic obstructive pulmonary disease, compared with 43 percent of community hospitals.
- There is little measurable variation among Massachusetts hospitals based on the available quality metrics related specifically to the 14 selected inpatient services. In contrast, the price variation for those services is significant, and lower priced hospitals are often associated with slightly higher quality scores and vice versa. For example, for vaginal deliveries, Milford Regional Medical Center and Tufts Medical Center have slightly higher quality scores related to deliveries, but have prices that are lower than or near the median hospital price, respectively. These results may not be surprising since carriers have previously stated that quality measures do not factor heavily in price negotiations.
- If private payer prices among hospital inpatient services and physician and professional services were narrowed to reflect a range spanning the existing 20th percentile to 80th percentile of payments, the potential total savings for these two groups of services would be about $267 million. Other scenarios such as modeling all payments at the median or just decreasing upper-end payments would yield even greater savings.
- Medicaid rates were consistently lower than the prices paid by private payers for both inpatient services and physician and professional services.[8] Private payer prices paid for physician services were also generally higher than Medicare rates, although by a lesser margin.
- There was no correlation between a hospital's share of Medicaid patients and the prices they received from private payers, with some of the lowest paid hospitals having the highest proportion of Medicaid discharges. About 70 percent of discharges for vaginal delivery at Holyoke Hospital and Cambridge Health Alliance were Medicaid patients, however these hospitals had some of the lowest private payer prices for this service, after adjusting for patient severity. This finding is inconsistent with providers' and private payers' assertions that higher private payer prices are needed to compensate for losses incurred by serving Medicaid patients.
- Medicare fee schedule rates, and to a lesser extent Medicaid, explicitly consider some of the factors cited by payers and providers that result in different prices paid across hospitals.[9] The variation associated with these factors results in a range in Medicare prices that is similar in breadth to the range found in this report's analysis of private payer prices. However, the relative rankings of hospitals are not similar across Medicare and private payers. Hospitals that receive higher payments from Medicare are not necessarily the same hospitals that receive higher payments from commercial carriers, suggesting that factors other than what Medicare considers are influencing private payer prices.

8 The only exceptions were vaginal delivery and cesarean delivery, for which some hospitals received higher payments from Medicaid than from private payers. Private payer prices were approximately 85 percent of the Medicaid prices for vaginal delivery at Boston Medical Center, Holyoke Hospital, Cambridge Health Alliance, and Martha's Vineyard Hospital.

9 For Medicare, these factors include: adjustments for area wages, indirect medical education, treating a disproportionate share of low income patients, cases that involve certain approved high cost new technologies, and high cost outliers.

Conclusion

In this report, DHCFP seeks to expand the understanding of price variation for hospitals and other professional services for a sample of health care services in three service categories: inpatient hospital care; outpatient hospital care; and physician and other professional services. These analyses are intended to promote transparency of differences in health care payments as well as inform ongoing policy discussions regarding approaches to mitigate rising health care costs. Any strategies to increase the efficiency of the Commonwealth's health care system must ensure the viability of efficient, low-cost providers in the marketplace, prioritize their role in an integrated health care delivery system, and establish them as key "building blocks" in a transition toward payment reform.

Introduction

Pursuant to the provisions of M.G.L. c. 118G, § 6 1/2, the Massachusetts Division of Health Care Finance and Policy (DHCFP) is required to conduct an annual study and hold public hearings regarding health care cost trends in the Commonwealth, and the factors that contribute to cost growth. During the 2010 health care cost trends hearings, many issues were raised related to price variation for health care services.[10] Purchasers, employers, and consumers noted that competition and market functionality are impeded when they are unaware of or insensitive to provider price differentials, and do not have complete price information available in choosing where to seek health care.[11] Such discussions echoed a fundamental principle established by the Special Commission on the Health Care Payment System in 2009 that differences in health care payments should reflect measurable differences in value (cost and quality) and should be transparent, including across different payers.[12] In the absence of these conditions, wide price differentials can persist, contributing to unnecessarily high health care costs.

In this report, DHCFP seeks to expand the understanding of price variation by examining prices paid by private health plans for commercially insured members in three service categories: inpatient hospital care; outpatient hospital care; and physician and other professional services.[13] In each category, a sample of high-volume health care services was selected to maximize comparability across providers. For inpatient services, differences in severity mix across providers were controlled within each diagnostic-related group (DRG). Since the selected physician and professional services are based on current procedural terminology (CPT) codes, they are narrowly defined without the need for further severity adjustments.

The report also analyzes the degree to which price variation for specific inpatient services relates to existing, publicly reported measures of health care quality. Composite quality scores for each hospital were computed using a selection of available quality measures related specifically to each inpatient service analyzed. While these quality measures were developed through a rigorous vetting process and are endorsed by the National Quality Forum (NQF), it should be noted that these measures do not represent the full set of considerations in evaluating hospital quality. Additionally, this analysis is not meant to imply that performance on these quality measures is currently a factor in price determinations.

10 See presentations and transcripts from the health care cost trends public hearings held March 2010. Available at: http://www.mass.gov/dhcfp/costtrends, accessed 5/22/2011.

11 One research study reviewing price variation noted that in some markets certain hospitals are so highly regarded that consumers perceive any health plan network that excludes these "must-have" hospitals as undesirable. In general, such hospitals can set higher prices. See: Paul B. Ginsburg, *Wide Variation in Hospital and Physician Payment Rates Evidence of Provider Market Power*, Research Brief No. 16, Center for Studying Health System Change, Washington, D.C., November 2010. Available at: http://www.hschange.org/CONTENT/1162/1162.pdf, accessed 5/22/2011.

12 The Massachusetts Special Commission on the Health Care Payment System developed a set of principles that were subsequently adapted to reflect feedback from numerous stakeholder groups, and reported in the Special Commission's final report. See: *Recommendations of the Special Commission on the Health Care Payment System*, July 16, 2009. Available at: http://www.mass.gov/Eeohhs2/docs/dhcfp/pc/Final_Report/Final_Report.pdf, accessed 5/22/2011.

13 Prices in this analysis include carrier payments as well as member copayments and deductible amounts.

The report also provides comparisons of private payer prices to Medicaid and Medicare. For this analysis, the state Medicaid and Medicare fee schedule rates were used as a proxy for the prices paid. The Medicaid Standard Payment Amount per Discharge (SPAD) for hospital inpatient services was used to arrive at DRG-specific prices.

Finally, the report provides the potential savings from various models that reduce or eliminate the current level of price variation. These models are intended for illustrative purposes only. Estimated impacts are extrapolated for inpatient services and physician procedures based on a subset of high-volume services within these two groups. For the selected services, the analysis considers the distribution of fee-for-service prices paid in 2009 by private insurance carriers in Massachusetts, and estimates cost savings had prices been more uniform across the state.

The carriers represented in this report account for approximately 79 percent of privately insured lives in Massachusetts. Among these carriers, fee-for-service business accounted for 97 percent of their total payments for all services in 2009. The methods underlying these analyses and estimates are outlined at the beginning of each section and are detailed in the *Technical Appendix*. Given the availability of data specific to each provider, the majority of this report's analysis focuses on inpatient hospital care.

It is important to note that a number of factors may influence the price of a medical service from provider to provider. Differences in resource costs may underlie substantial differences in prices negotiated for the same service. Wage levels, rent, and other facility costs vary across the state, creating geographic differences in service cost even when providers use the same type and intensity of resources to produce a given health care service. Although this analysis measures the extent of price variation and relates it to some available measures of quality and payer mix, the purpose of this analysis was not to enumerate the various factors that may influence price, nor to draw any potential correlations between all such factors and price. Rather, recent state law, Chapter 288 of the Acts of 2010, created a Special Commission on Provider Price Reform to further examine this issue.[14]

Ultimately, these analyses are intended to promote discussion regarding potential cost saving opportunities in the Massachusetts health care system and to inform the ongoing development of payment and delivery system reform strategies.

14 The Special Commission on Provider Price Reform is specifically charged with examining "(i) the variation in relative prices paid to providers within similar provider groups; (ii) the variation in costs of providers for services of comparable acuity, quality and complexity; (iii) the variation in volume of care provided at providers with low and high levels of relative prices or health status adjusted total medical expenses; (iv) the correlation between price paid to providers and (1) the quality of care, (2) the acuity of the patient population, (3) the provider's payor mix, (4) the provision of unique services, including specialty teaching services and community services, and (5) operational costs, including labor costs; (iii) the correlation between price paid to providers and, in the case of hospitals, status as a disproportionate share hospital, a specialty hospital, a pediatric specialty hospital or as an academic teaching hospital; and (v) policies to promote the use of providers with low health status adjusted total medical expenses." See Chapter 288 of the Acts of 2010, § 67.

Section 1: Price Variation for Hospital Inpatient Services

A subset of 14 common diagnostic-related groups (DRGs) was used to explore the extent of price variation for hospital inpatient services. Prices are the actual payment made for the services that include the carrier payments as well as member co-payments and deductibles. Hospital inpatient prices are for hospital facility payment only and not surgeon's or physician's fees that are billed separately. The 14 DRGs were selected because they are high-volume, relatively common procedures, and account for approximately 40 percent of private payer inpatient admissions and 32 percent of private payer inpatient health care spending (see Table 1). While using specific DRGs allows for greater comparability, these examples may not be representative of all inpatient health care services or spending.

Table 1: Discharges and Total Payments for Selected High-Volume DRGs, 2009

APR-DRG	Discharges		Payments	
	Number	Percent of discharges for all DRGs	Total ($millions)	Percent of payments for all DRGs
Total, all selected DRGs	45,320	40.4%	$432.6	32.1%
Selected surgical DRGs	7,734	6.9%	$79.8	5.9%
Laparoscopic cholecystectomy (263)	1,279	1.1%	$12.7	0.9%
Procedures for obesity (403)	2,312	2.1%	$31.1	2.3%
Uterine and adnexa procedures for nonmalignancy except leiomyoma (513)	1,730	1.5%	$15.1	1.1%
Appendectomy (225)	2,413	2.1%	$21.0	1.6%
Selected DRGs related to musculoskeletal procedures	7,313	6.5%	$138.2	10.3%
Knee joint replacement (302)	2,835	2.5%	$61.0	4.5%
Intervertebral disc excision and decompression (310)	1,221	1.1%	$12.7	0.9%
Knee and lower leg procedures (313)	1,120	1.0%	$14.4	1.1%
Hip joint replacement (301)	2,137	1.9%	$50.1	3.7%
Selected medical DRGs	4,238	3.8%	$43.4	3.2%
Chronic obstructive pulmonary disease (140)	1,146	1.0%	$10.4	0.8%
Pneumonia (139)	1,588	1.4%	$13.7	1.0%
Acute myocardial infarction (190)	691	0.6%	$9.5	0.7%
Congestive heart failure (194)	813	0.7%	$9.8	0.7%
Selected maternity DRGs	26,035	23.2%	$171.2	12.7%
Cesarean delivery (540)	8,947	8.0%	$76.4	5.7%
Vaginal delivery (560)	17,088	15.2%	$94.7	7.0%

Source: Mathematica Policy Research analysis of private insured and self-insured fee-for-service claims for Massachusetts residents.

Note: Payments include patient cost-sharing in fee-for-service coverage. Payments made under managed care contracts are not included.

In order to appropriately determine the extent of price variation for hospital inpatient services, three different analytic approaches were utilized:

- The first method considers all payments made by commercial health plans for privately insured members for a given service regardless of the provider. This methodology was also employed for the hospital outpatient and the physician and other professional service analyses.
- The second methodology compares the severity-adjusted median price each hospital received for a given DRG to the statewide median hospital price.
- The third approach compares the severity-adjusted median price each hospital received for a given DRG to the median price of other hospitals for the specified DRG.

Brief descriptions of methodology are provided at the beginning of each section; more detailed explanations are available in the *Technical Appendix*.

Section 1.1: Statewide Variation in Massachusetts Hospital Inpatient Services

Method: This review of price variation considers the actual prices paid for each DRG, regardless of which hospital provided the service. In other words, the payments made for each service were arrayed from low to high and are not associated with specific hospitals. As such, it quantifies the variation in the minimum and maximum prices paid for each DRG statewide. The analyses are done separately at each severity level. Although this analysis is performed after excluding outliers, the minimum and the maximum values can be influenced by a relatively small number of very high or very low prices at either end of the statewide distribution. Partly due to this effect, the results in this section describe a larger variation in statewide prices by DRG than the results of Section 1.3, which utilizes hospital-specific medians.

Statewide, prices paid to hospitals for each selected DRG varied widely (see Tables 2 through 6). Prices paid for an appendectomy (DRG 225) varied by more than 11-fold for a severity-1[15] stay and 16-fold for a severity-2 stay. Prices paid for each of the other selected DRGs varied less significantly, but in no instance did they vary by less than 300 percent statewide.

15 The severity levels are assigned through the APR-DRG and account for factors such as age and co-morbidities.

Table 2: Median Price and Ratio of Maximum to Minimum Price for Selected High-Volume DRGs, 2009

APR-DRG	Median price				Ratio of maximum to minimum price			
	Severity 1	Severity 2	Severity 3	Severity 4	Severity 1	Severity 2	Severity 3	Severity 4
Surgical DRGs								
Laparoscopic cholecystectomy (263)	$8,648	$11,584	$17,052	--	7.0	7.5	3.6	--
Procedures for obesity (403)	$13,102	$14,022	$24,552	--	6.3	9.1	8.0	--
Uterine and adnexa procedures for nonmalignancy except leiomyoma (513)	$8,542	$9,826	$16,798	--	9.1	8.8	4.2	--
Appendectomy (225)	$7,576	$10,675	--	--	11.3	16.1	--	--
DRGs related to musculoskeletal procedures								
Knee joint replacement (302)	$21,241	$21,887	$28,173	--	9.8	8.8	3.7	--
Intervertebral disc excision and decompression (310)	$9,471	$11,184	$26,515	--	7.5	19.0	3.5	--
Knee and lower leg procedures (313)	$11,790	$15,010	$31,907	--	9.1	6.4	3.6	--
Hip joint replacement (301)	$23,383	$25,039	$32,581	--	8.3	6.6	5.6	--
Medical DRGs								
Chronic obstructive pulmonary disease (140)	$6,592	$7,455	$12,382	--	5.5	5.2	4.6	--
Pneumonia (139)	$5,255	$7,278	$12,420	$21,097	15.0	13.0	13.5	3.7
Acute myocardial infarction (190)	$1,068	$2,351	$2,858	$4,705	22.4	29.2	19.7	18.7
Congestive heart failure (194)	$8,400	$11,192	$17,153	$31,109	11.4	8.7	14.5	2.7
Maternity DRGs								
Cesarean delivery (540)	$7,598	$8,718	$11,389	$17,134	4.9	7.2	7.2	3.2
Vaginal delivery (560)	$4,990	$5,692	$6,450	--	6.1	5.6	7.3	--

Source: Mathematica Policy Research analysis of private insured and self-insured fee-for-service claims for Massachusetts residents.

Note: Payments include patient cost sharing in fee-for-service coverage. Payments made under managed care contracts are not included.

Table 3: Observed Prices for Selected High-Volume Surgical DRGs by Severity of Illness, 2009

APR-DRG and severity	Minimum price	Median price	Average price	Maximum price	Difference between maximum and minimum price	Ratio of maximum to minimum price
Laparoscopic cholecystectomy (263)						
Severity 1	$2,858	$8,648	$8,703	$19,932	$17,074	7.0
Severity 2	$3,787	$11,584	$11,533	$28,479	$24,692	7.5
Severity 3	$11,432	$17,052	$19,326	$41,424	$29,992	3.6
Procedures for obesity (403)						
Severity 1	$3,726	$13,102	$12,877	$23,631	$19,905	6.3
Severity 2	$4,734	$14,022	$14,159	$43,093	$38,359	9.1
Severity 3	$5,830	$24,552	$22,822	$46,499	$40,669	8.0
Uterine and adnexa procedures for nonmalignancy except leiomyoma (513)						
Severity 1	$2,342	$8,542	$8,624	$21,247	$18,905	9.1
Severity 2	$2,632	$9,826	$9,908	$23,112	$20,480	8.8
Severity 3	$7,447	$16,798	$18,363	$31,340	$23,893	4.2
Appendectomy (225)						
Severity 1	$1,781	$7,576	$7,762	$20,188	$18,407	11.3
Severity 2	$2,342	$10,675	$11,399	$37,718	$35,376	16.1

Source: Mathematica Policy Research analysis of private insured and self-insured fee-for-service claims for Massachusetts residents.

Note: Payments include patient cost sharing in fee-for-service coverage. Payments made under managed care contracts are not included.

Table 4: Observed Prices for Selected High-Volume DRGs Related to Musculoskeletal Procedures by Severity of Illness, 2009

APR-DRG and severity	Minimum price	Median price	Average price	Maximum price	Difference between maximum and minimum price	Ratio of maximum to minimum price
Knee joint replacement (302)						
Severity 1	$5,202	$21,241	$21,040	$50,726	$45,524	9.8
Severity 2	$7,599	$21,887	$22,743	$66,901	$59,302	8.8
Severity 3	$16,069	$28,173	$30,376	$59,252	$43,183	3.7
Intervertebral disc excision and decompression (310)						
Severity 1	$2,832	$9,471	$9,276	$21,187	$18,355	7.5
Severity 2	$2,492	$11,184	$12,629	$47,465	$44,973	19.0
Severity 3	$16,807	$26,515	$28,946	$59,252	$42,446	3.5
Knee and lower leg procedures (313)						
Severity 1	$2,863	$11,790	$12,224	$26,179	$23,316	9.1
Severity 2	$6,311	$15,010	$15,644	$40,590	$34,280	6.4
Severity 3	$11,790	$31,908	$27,503	$42,892	$31,102	3.6
Hip joint replacement (301)						
Severity 1	$5,423	$23,383	$22,626	$44,867	$39,444	8.3
Severity 2	$9,612	$25,039	$25,235	$63,908	$54,296	6.6
Severity 3	$10,528	$32,581	$34,572	$59,252	$48,724	5.6

Source: Mathematica Policy Research analysis of private insured and self-insured fee-for-service claims for Massachusetts residents.

Note: Payments include patient cost-sharing in fee-for-service coverage. Payments made under managed care contracts are not included.

Table 5: Observed Prices for Selected High-Volume Medical DRGs by Severity of Illness, 2009

APR-DRG and severity	Minimum price	Median price	Average price	Maximum price	Difference between maximum and minimum price	Ratio of maximum to minimum price
Chronic obstructive pulmonary disease (140)						
Severity 1	$2,858	$6,592	$7,358	$15,815	$12,957	5.5
Severity 2	$4,759	$7,455	$8,810	$24,736	$19,977	5.2
Severity 3	$5,385	$12,382	$12,615	$24,756	$19,371	4.6
Pneumonia (139)						
Severity 1	$1,935	$5,255	$6,122	$29,025	$27,090	15.0
Severity 2	$1,815	$7,278	$7,908	$23,650	$21,836	13.0
Severity 3	$2,178	$12,420	$11,998	$29,425	$27,247	13.5
Severity 4	$14,099	$21,097	$25,145	$51,832	$37,733	3.7
Acute myocardial infarction (190)						
Severity 1	$1,068	$12,391	$12,854	$23,935	$22,867	22.4
Severity 2	$2,351	$14,757	$16,988	$68,695	$66,344	29.2
Severity 3	$2,858	$16,418	$20,137	$56,256	$53,398	19.7
Severity 4	$4,705	$41,814	$41,605	$87,905	$83,201	18.7
Congestive heart failure (194)						
Severity 1	$1,863	$8,400	$9,311	$21,264	$19,401	11.4
Severity 2	$4,092	$11,192	$11,888	$35,440	$31,348	8.7
Severity 3	$2,937	$17,153	$18,018	$42,528	$39,591	14.5
Severity 4	$18,083	$31,109	$32,350	$48,786	$30,703	2.7

Source: Mathematica Policy Research analysis of private insured and self-insured fee-for-service claims for Massachusetts residents.

Note: Payments include patient cost-sharing in fee-for-service coverage. Payments made under managed care contracts are not included.

Table 6: Observed Prices for Selected High-Volume Maternity DRGs by Severity of Illness, 2009

APR-DRG and severity	Minimum price	Median price	Average price	Maximum price	Difference between maximum and minimum price	Ratio of maximum to minimum price
Cesarean delivery (540)						
Severity 1	$3,244	$7,598	$7,859	$15,915	$12,671	4.9
Severity 2	$2,828	$8,718	$9,338	$20,424	$17,596	7.2
Severity 3	$3,621	$11,389	$13,266	$26,018	$22,397	7.2
Severity 4	$9,600	$17,134	$19,156	$30,660	$21,059	3.2
Vaginal delivery (560)						
Severity 1	$1,810	$4,990	$5,225	$11,066	$9,256	6.1
Severity 2	$2,182	$5,692	$5,884	$12,177	$9,995	5.6
Severity 3	$2,812	$6,450	$7,656	$20,446	$17,634	7.3

Source: Mathematica Policy Research analysis of private insured and self-insured fee-for-service claims for Massachusetts residents.

Note: Payments include patient cost-sharing in fee-for-service coverage. Payments made under managed care contracts are not included.

Section 1.2: Price Variation by Hospital Type and Location

Method: This review of price variation compares prices paid at individual hospitals, after excluding hospitals with fewer than 30 discharges for each DRG and adjusting for patient severity. Each hospital's severity-adjusted prices by DRG reflect the payments it receives for each DRG given a standardized mix of severity levels. In contrast to the wide variation in prices noted in Section 1.1, this methodology used the hospital medians to produce hospital prices that are less sensitive to extreme values than using the mean. The median severity-adjusted price for each hospital is then compared to the statewide median by DRG from Section 1.1.

The highest severity-adjusted prices were often received by Boston metro area hospitals.

- For four DRGs (uterine and adnexa procedures, knee joint replacement, invertebral disc excision and compression, and hip joint replacement), more than 70 percent of discharges in Boston metro area hospitals were paid median severity-adjusted prices above the statewide median (Table 7).

However, hospitals outside the Boston metro area[16] also received relatively high prices for some services.

- Three-quarters (75 percent) of discharges related to procedures for obesity performed in non-Boston metro area hospitals were paid at prices above the statewide median, as were more than 60 percent of discharges for laparoscopic cholecystectomy and chronic obstructive pulmonary disease (COPD) (Table 7).

16 Boston metro area hospitals are those located in the Boston Emergency Medical Services (EMS) area (Region IV). A list of these hospitals is provided in the *Technical Appendix*.

Table 7: Percent of Hospitals and Discharges by Region with Severity-Adjusted Median Prices Above the Statewide Median: Selected High-Volume DRGs, 2009

APR-DRG	Total, all regions			Boston metro area			Other regions		
	Number of hospitals with at least 30 discharges	Percent of hospitals with a severity-adjusted median price above the statewide median	Percent of discharges	Number of hospitals with at least 30 discharges	Percent of hospitals with a severity-adjusted median price above the statewide median	Percent of discharges	Number of hospitals with at least 30 discharges	Percent of hospitals with a severity-adjusted median price above the statewide median	Percent of discharges
Selected surgical DRGs									
Laparascopic cholecystectomy (263)	14	50.0	58.8	9	44.4	57.4	5	60.0	61.4
Procedures for obesity (403)	20	55.0	58.8	13	46.2	50.0	7	71.4	75.3
Uterine and adnexa procedures for nonmalignancy except leiomyoma (513)	19	42.1	55.5	8	62.5	71.9	11	27.3	37.3
Appendectomy (225)	25	36.0	46.0	12	41.7	50.0	13	30.8	39.8
Selected DRGs related to musculoskeletal procedures									
Knee joint replacement (302)	66	32.0	55.7	23	45.5	73.8	43	21.7	18.9
Intervertebral disc excision and decompression (310)	13	38.5	56.0	8	62.5	73.5	5	0.0	0.0
Knee and lower leg procedures (313)	11	54.5	65.1	9	55.6	67.3	2	50.0	55.6
Hip joint replacement (301)	12	33.3	64.1	8	50.0	74.8	4	0.0	0.0
Selected medical DRGs									
Chronic obstructive pulmonary disease (140)	12	50.0	59.0	4	50.0	56.3	8	50.0	60.6
Pneumonia (139)	20	40.0	45.4	10	50.0	52.5	10	30.0	36.6
Acute myocardial infarction (190)	7	42.9	47.3	5	40.0	42.9	2	50.0	53.8
Congestive heart failure (194)	4	50.0	52.8	4	50.0	52.8	0	--	--
Selected maternity DRGs									
Cesarean delivery (540)	39	28.2	49.5	14	35.7	62.5	25	24.0	26.9
Vaginal delivery (560)	46	23.9	47.4	14	35.7	61.3	32	18.8	24.7

Source: Mathematica Policy Research analysis of private insured and self-insured fee-for-service claims for Massachusetts residents.

Note: Payments include patient cost-sharing in fee-for-service coverage. Payments made under managed care contracts are not included.

In the Boston metro area, relatively few hospitals accounted for the majority of high-priced discharges for a given DRG. This suggests that volume tends to be concentrated in higher paid Boston metro area hospitals.

- The median severity-adjusted price for more than 60 percent of Boston metro area maternity discharges was above the statewide median, but this was attributable to just five hospitals (Table 7).
- For hip joint replacement, 75 percent of Boston metro area discharges were paid above the statewide median, corresponding to just four hospitals (Table 7).

In general, tertiary care hospitals were more likely to be paid relatively high median prices than community hospitals.[17]

- In the Boston metro area, 80 percent of tertiary care hospitals (accounting for 91 percent of discharges) were paid median prices for uterine and adnexa procedures above the statewide median compared with 33 percent of community hospitals (accounting for 35 percent of discharges) (Table 8).

Table 8: Percent of Hospitals and Discharges by Region and Type of Hospital with Severity-Adjusted Median Price above the Statewide Median: Selected High-Volume Surgical DRGs, 2009 (continued on next page)

Region and APR-DRG	All hospitals		Community hospitals		Tertiary care hospitals		Specialty hospitals	
	Percent of hospitals with a severity-adjusted median price above the statewide median	Percent of discharges	Percent of hospitals with a severity-adjusted median price above the statewide median	Percent of discharges	Percent of hospitals with a severity-adjusted median price above the statewide median	Percent of discharges	Percent of hospitals with a severity-adjusted median price above the statewide median	Percent of discharges
All regions								
Laparoscopic cholecystectomy (263)	50.0	58.8	25.0	34.5	83.3	88.1	--	--
Procedures for obesity (403)	55.0	58.8	30.0	40.7	80.0	76.2	--	--
Uterine and adnexa procedures for nonmalignancy except leiomyoma (513)	42.1	55.5	30.0	31.0	55.6	73.6	--	--
Appendectomy (225)	36.0	46.0	31.3	37.6	37.5	44.5	100.0	100.0

17 Table 3 of the *Technical Appendix* provides the classification of hospitals.

Table 8: Percent of Hospitals and Discharges by Region and Type of Hospital with Severity-Adjusted Median Price above the Statewide Median: Selected High-Volume Surgical DRGs, 2009 (continued from previous page)

Region and APR-DRG	All hospitals		Community hospitals		Tertiary care hospitals		Specialty hospitals	
	Percent of hospitals with a severity-adjusted median price above the statewide median	Percent of discharges	Percent of hospitals with a severity-adjusted median price above the statewide median	Percent of discharges	Percent of hospitals with a severity-adjusted median price above the statewide median	Percent of discharges	Percent of hospitals with a severity-adjusted median price above the statewide median	Percent of discharges
Boston metro area								
Laparoscopic cholecystectomy (263)	44.4	57.4	20.0	35.9	75.0	82.1	--	--
Procedures for obesity (403)	46.2	50.0	16.7	22.0	71.4	68.7	--	--
Uterine and adnexa procedures for nonmalignancy except leiomyoma (513)	62.5	71.9	33.3	34.7	80.0	91.1	--	--
Appendectomy (225)	41.7	50.0	28.6	40.5	50.0	41.7	100.0	100.0
All other regions								
Laparoscopic cholecystectomy (263)	60.0	61.4	33.3	31.9	100.0	100.0	--	--
Procedures for obesity (403)	71.4	75.3	50.0	62.1	100.0	100.0	--	--
Uterine and adnexa procedures for nonmalignancy except leiomyoma (513)	27.3	37.3	28.6	28.2	25.0	46.9	--	--
Appendectomy (225)	30.8	39.8	33.3	33.0	25.0	47.5	--	--

Source: Mathematica Policy Research analysis of private insured and self-insured fee-for-service claims for Massachusetts residents.

Note: Payments include patient cost-sharing in fee-for-service coverage. Payments made under managed care contracts are not included.

- For COPD, tertiary care hospitals throughout the state were paid median severity-adjusted prices that exceeded the statewide median, compared with 33 percent of community hospitals (Table 9).

Table 9: Percent of Hospitals and Discharges by Region and Type of Hospital with Severity-Adjusted Median Price above the Statewide Median: Selected High-Volume Medical DRGs, 2009

Region and APR-DRG	All hospitals		Community hospitals		Tertiary care hospitals		Specialty hospitals	
	Percent of hospitals with a severity-adjusted median price above the statewide median	Percent of discharges	Percent of hospitals with a severity-adjusted median price above the statewide median	Percent of discharges	Percent of hospitals with a severity-adjusted median price above the statewide median	Percent of discharges	Percent of hospitals with a severity-adjusted median price above the statewide median	Percent of discharges
All regions								
Chronic obstructive pulmonary disease (140)	50.0	59.0	33.3	42.9	100.0	100.0	--	--
Pneumonia (139)	40.0	45.4	18.2	14.0	66.7	76.4	--	--
Acute myocardial infarction (190)	42.9	47.3	--	--	50.0	53.9	--	--
Congestive heart failure (194)	50.0	52.8	--	--	50.0	52.8	--	--
Boston metro area								
Chronic obstructive pulmonary disease (140)	50.0	56.3	33.3	45.1	100.0	100.0	--	--
Pneumonia (139)	50.0	52.5	25.0	15.0	66.7	76.9	--	--
Acute myocardial infarction (190)	40.0	42.9	--	--	50.0	54.0	--	--
Congestive heart failure (194)	50.0	52.8	--	--	50.0	52.8	--	--
All other regions								
Chronic obstructive pulmonary disease (140)	50.0	60.6	33.3	41.4	100.0	100.0	--	--
Pneumonia (139)	30.0	36.7	14.3	13.2	66.7	75.5	--	--
Acute myocardial infarction (190)	50.0	53.8	--	--	50.0	53.8	--	--
Congestive heart failure (194)	--	--	--	--	--	--	--	--

Source: Mathematica Policy Research analysis of private insured and self-insured fee-for-service claims for Massachusetts residents.

Note: Payments include patient cost-sharing in fee-for-service coverage. Payments made under managed care contracts are not included.

- All tertiary care hospitals outside of the Boston metro area were paid a median price for procedures related to obesity that was above the statewide median, compared with 50 percent of community hospitals (Table 8).
- For knee joint replacement conducted in hospitals outside the Boston metro area, tertiary care hospitals were slightly less likely than community hospitals to receive a median price above the statewide median (17 percent versus 25 percent), although they accounted for about the same percentage of discharges (18 versus 20 percent) (Table 10).

Table 10: Percent of Hospitals and Discharges by Region and Type of Hospital with Severity-Adjusted Median Price above the Statewide Median: Selected High-Volume DRGs Related to Musculoskeletal Procedures, 2009 (continued on next page)

Region and APR-DRG	All hospitals		Community hospitals		Tertiary care hospitals		Specialty hospitals	
	Percent of hospitals with a severity-adjusted median price above the statewide median	Percent of discharges	Percent of hospitals with a severity-adjusted median price above the statewide median	Percent of discharges	Percent of hospitals with a severity-adjusted median price above the statewide median	Percent of discharges	Percent of hospitals with a severity-adjusted median price above the statewide median	Percent of discharges
All regions								
Knee joint replacement (302)	32.0	55.7	28.6	59.1	36.4	50.9	--	--
Intervertebral disc excision and decompression (310)	38.5	56.0	16.7	21.1	57.1	73.7	--	--
Knee and lower leg procedures (313)	54.5	65.1	25.0	28.6	66.7	75.9	100.0	100.0
Hip joint replacement (301)	33.3	64.1	25.0	68.7	37.5	57.3	--	--
Boston metro area								
Knee joint replacement (302)	45.5	73.8	33.3	72.6	60.0	75.8	--	--
Intervertebral disc excision and decompression (310)	62.5	73.5	33.3	32.6	80.0	89.9	--	--
Knee and lower leg procedures (313)	55.6	67.3	25.0	28.6	75.0	83.7	100.0	100.0
Hip joint replacement (301)	50.0	74.8	33.3	72.7	60.0	79.1	--	--
All other regions								

Source: Mathematica Policy Research analysis of private insured and self-insured fee-for-service claims for Massachusetts residents.

Note: Payments include patient cost-sharing in fee-for-service coverage. Payments made under managed care contracts are not included

Table 10: Percent of Hospitals and Discharges by Region and Type of Hospital with Severity-Adjusted Median Price above the Statewide Median: Selected High-Volume DRGs Related to Musculoskeletal Procedures, 2009 (continued from previous page)

Region and APR-DRG	All hospitals		Community hospitals		Tertiary care hospitals		Specialty hospitals	
	Percent of hospitals with a severity-adjusted median price above the statewide median	Percent of discharges	Percent of hospitals with a severity-adjusted median price above the statewide median	Percent of discharges	Percent of hospitals with a severity-adjusted median price above the statewide median	Percent of discharges	Percent of hospitals with a severity-adjusted median price above the statewide median	Percent of discharges
Knee joint replacement (302)	21.4	18.9	25.0	19.5	16.7	18.4	--	--
Intervertebral disc excision and decompression (310)	--	--	--	--	--	--	--	--
Knee and lower leg procedures (313)	50.0	55.6	--	--	50.0	55.6	--	--
Hip joint replacement (301)	--	--	--	--	--	--	--	--

Source: Mathematica Policy Research analysis of private insured and self-insured fee-for-service claims for Massachusetts residents.

Note: Payments include patient cost-sharing in fee-for-service coverage. Payments made under managed care contracts are not included.

For cesarean and vaginal deliveries, the highest paid providers have the largest share of patients for these two services.

- While only 28 percent of hospitals providing cesarean deliveries and 24 percent of hospitals providing vaginal deliveries had a median severity-adjusted price that was higher than the statewide median price, services delivered by those providers accounted for 50 and 47 percent of discharges, respectively (Table 11).

Table 11: Percent of Hospitals and Discharges by Region and Type of Hospital with Severity-Adjusted Median Price above the Statewide Median: Selected High-Volume Maternity DRGs, 2009

Region and APR-DRG	All hospitals		Community hospitals		Tertiary care hospitals		Specialty hospitals	
	Percent of hospitals with a severity-adjusted median price above the statewide median	Percent of discharges	Percent of hospitals with a severity-adjusted median price above the statewide median	Percent of discharges	Percent of hospitals with a severity-adjusted median price above the statewide median	Percent of discharges	Percent of hospitals with a severity-adjusted median price above the statewide median	Percent of discharges
All regions								
Cesarean delivery (540)	28.2	49.5	16.0	21.1	53.8	79.2	--	--
Vaginal delivery (560)	23.9	47.4	15.6	20.2	46.2	73.0	--	--
Boston metro area								
Cesarean delivery (540)	35.7	62.5	16.7	31.4	57.1	86.9	--	--
Vaginal delivery (560)	35.7	61.3	16.7	29.8	57.1	82.4	--	--
All other regions								
Cesarean delivery (540)	24.0	26.9	15.8	9.2	50.0	58.2	--	--
Vaginal delivery (560)	18.8	24.7	15.4	10.9	33.3	47.9	--	--

Source: Mathematica Policy Research analysis of private insured and self-insured fee-for-service claims for Massachusetts residents.

Note: Payments include patient cost-sharing in fee-for-service coverage. Payments made under managed care contracts are not included.

Section 1.3: Hospital Specific Price Variation for Selected DRGs

Method: As in Section 1.2, the analysis of hospital specific inpatient prices is based on a comparison of hospital specific median prices, after adjusting for severity and excluding hospitals with fewer than 30 discharges for that DRG. However, the severity-adjusted price in this section is not compared to the statewide median (as in Section 1.2) which may be influenced by volume. For example, since nearly half of the discharges for vaginal delivery occur at higher-paid hospitals, the statewide median price will be skewed upwards towards those institutions' prices. Instead, the severity-adjusted prices in this section are compared to the median price of other hospitals for the specified DRG category. This approach creates a price index, referred to henceforth as a "price relativity," which allows prices to be more appropriately compared across hospitals for the same services.

For the 14 studied DRGs, there is wide variation among hospital price relativities. The lowest price relativity across all DRGs and hospitals was 0.67, or 33 percent below the median hospital (acute myocardial infarction, see Table 12). The highest price relativity across all DRGs and hospitals was 1.49, or 49 percent above the median hospital (cesarean delivery).

Table 12: Range in Price Relativity by DRG

DRG	Price Relativity	
	Minimum	Maximum
Pneumonia (DRG 139)	0.75	1.26
Chronic Obstructive Pulmonary Disease (DRG 140)	0.78	1.30
Acute Myocardial Infarction (DRG 190)	0.67	1.32
Congestive Heart Failure (DRG 194)	0.79	1.04
Appendectomy (DRG 225)	0.75	1.46
Laparoscopic Cholecystectomy (DRG 263)	0.75	1.30
Hip Joint Replacement (DRG 301)	0.87	1.18
Knee Joint Replacement (DRG 302)	0.71	1.28
Intervertebral disc excision and decompression (DRG 310)	0.70	1.17
Knee and lower leg procedures (DRG 313)	0.73	1.18
Procedures for obesity (DRG 403)	0.74	1.32
Uterine and adnexa procedures for non-malignancy except leiomyoma (DRG 513)	0.72	1.21
Cesarean delivery (DRG 540)	0.70	1.49
Vaginal delivery (DRG 560)	0.76	1.37

The widest price variation was found for cesarean delivery, ranging from 30 percent below the median (Cambridge Health Alliance) to 49 percent above the median (Massachusetts General Hospital). Stated another way, the highest paid hospital for cesarean delivery was paid 112 percent more than the lowest paid hospital (see *Statistical Appendix*, Table 1.13). For acute myocardial infarction, the highest paid hospital (U Mass Memorial Medical Center) received 97 percent more than the lowest paid hospital (South Shore Hospital), with price relativities ranging from 33 percent below the median to 32 percent above. However, only seven hospitals had enough volume to be compared for this DRG (see *Statistical Appendix*, Table 1.3). For all but two DRGs, the highest paid hospital received over 50 percent more than the lowest paid hospital.

Detailed price information, including the severity-adjusted median prices and price relativities for each hospital with more than 30 discharges for each DRG, is provided in the *Statistical Appendix,* Tables 1.1 through 1.14.

Distribution of Services Delivered by Hospital Specific Price Range

As indicated above, Massachusetts hospitals exhibit a notable variation in prices across multiple high volume DRGs. Such price variation is of greater consequence to total Massachusetts health care expenditures if a disproportionate share of patients seeks services at higher paid providers.

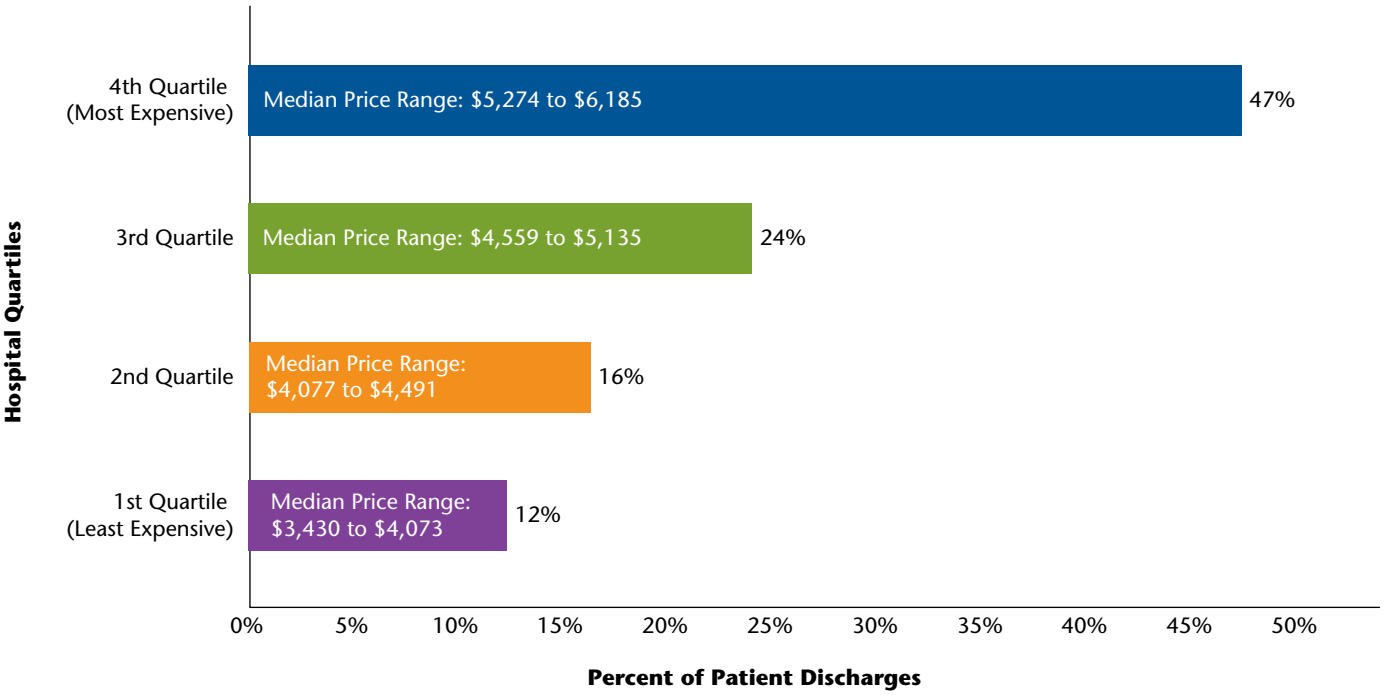
This analysis explores the extent to which Massachusetts residents receive care at higher or lower cost providers for a sample of seven DRGs. A DRG was included in the volume distribution analysis if there were at least 20 hospitals with at least 30 discharges for that condition or procedure. Seven of the 14 DRGs had enough volume to be included in the analysis. Quartiles of hospital prices were created to show the distribution of discharges across the state. The first quartile refers to the least expensive group and the fourth quartile refers to the most expensive. Hospitals were grouped into quartiles based on the values of their severity-adjusted median prices for each DRG. The number of discharges was then summed across the hospitals in each quartile.

Figures 1 through 7 highlight the distribution of discharges at the various price levels. The largest share of patient volume was clustered in the most highly paid quartile of hospitals for five of the seven analyzed DRGs, including vaginal deliveries, appendectomy, knee joint replacement procedures, uterine and adnexa procedures, and cesarean deliveries. For all seven DRGs, more than 50 percent of discharges were at hospitals in the upper third and fourth quartiles combined.

Vaginal Delivery (DRG 560) (Figure 1)

For vaginal delivery, almost half (47 percent) of the state's discharges were at the hospitals that fell into the fourth (most expensive) quartile. Hospitals in the fourth quartile had median prices ranging from $5,274 to $6,185, while prices in the first quartile (least expensive) ranged from $3,430 to $4,073. More than 70 percent of the discharges were from hospitals in the third and fourth price quartiles.

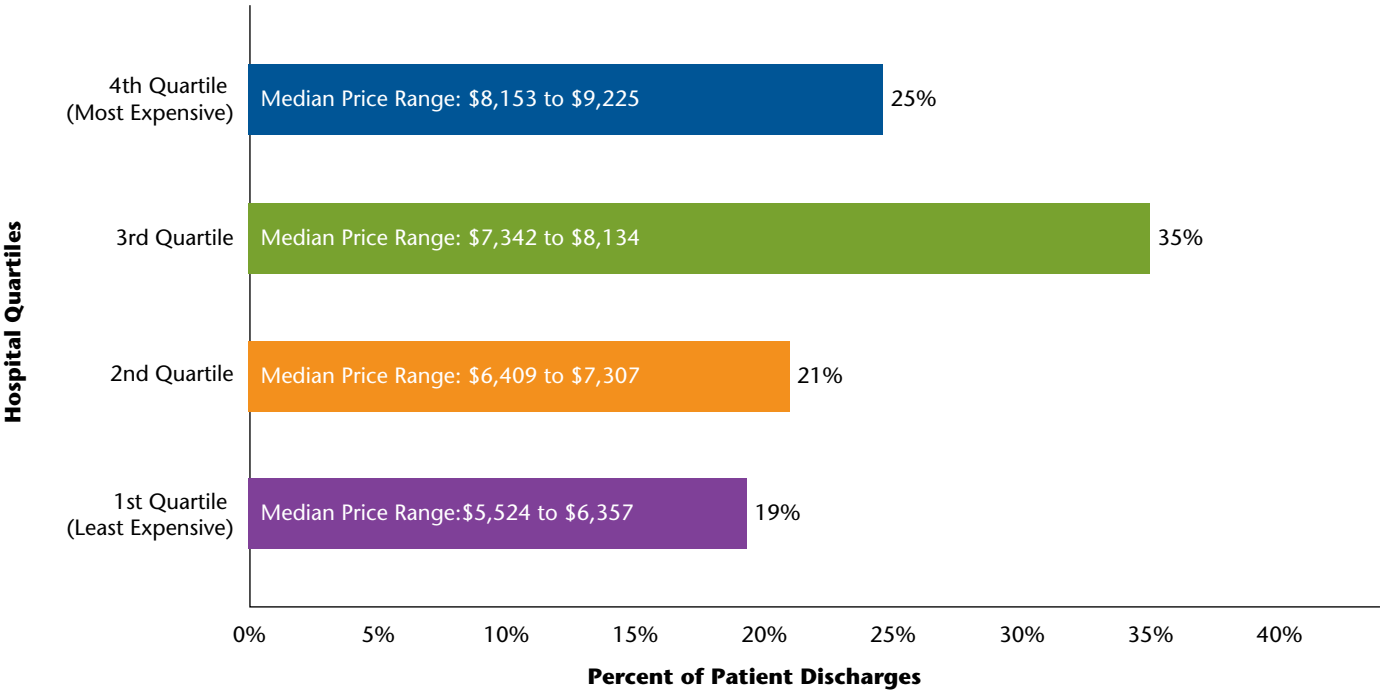
Figure 1: Patient Discharge Volume by Hospital Median Severity-Adjusted Price Quartile Classification (Vaginal Delivery - DRG 560)



Pneumonia (DRG 139) (Figure 2)

The largest proportion of pneumonia discharges in the state were at hospitals that fell into the third quartile (second most expensive), with 35 percent of the state's discharges. This quartile represents median hospital prices that ranged from $7,342 to $8,134. Sixty percent of pneumonia discharges fell within the upper third and fourth quartile of hospital prices.

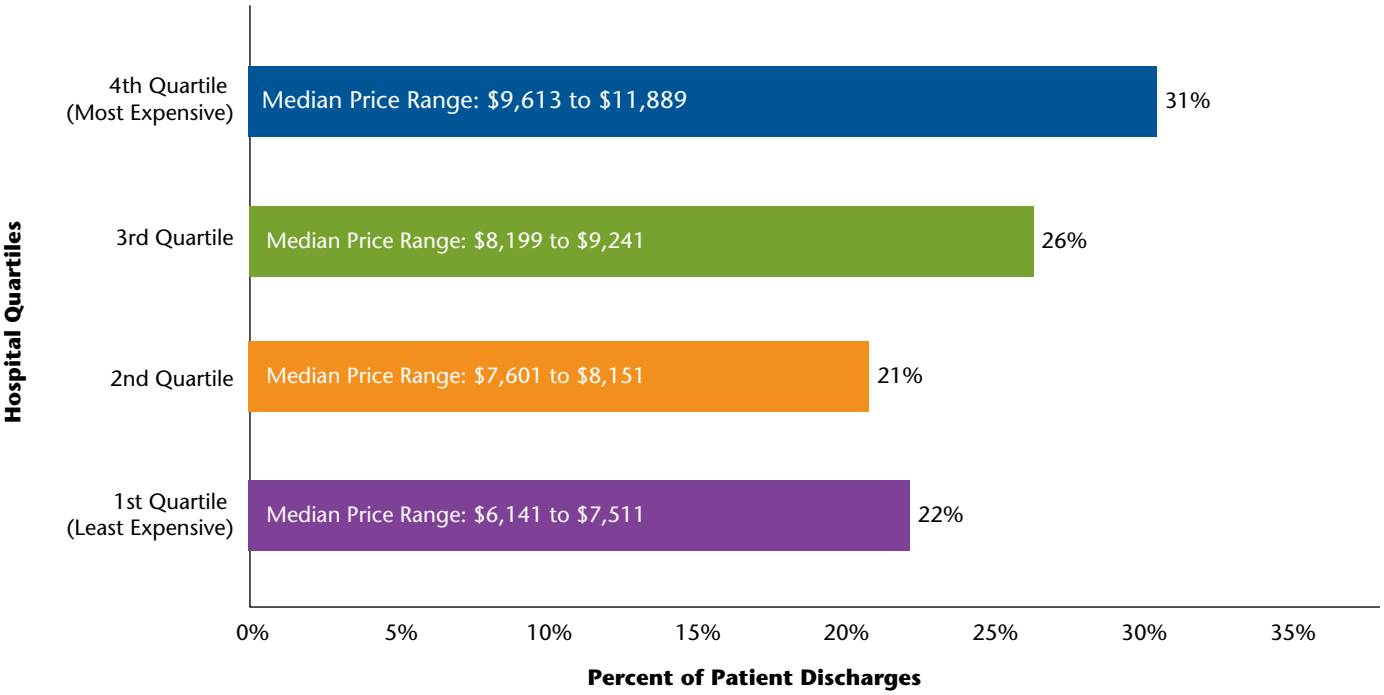
Figure 2: Patient Discharge Volume by Hospital Severity-Adjusted Median Price Quartile Classification (Pneumonia - DRG 139)



Appendectomy (DRG 225) (Figure 3)

The distribution of discharges by price quartile for appendectomy was more evenly distributed than for the other DRGs. While the fourth quartile accrued the largest share of discharges (31 percent) at a range of median prices from $9,613 to $11,889, the third, first, and second quartiles followed closely behind with 26 percent, 22 percent, and 21 percent of discharges, respectively. Fifty-seven percent of discharges fell within the upper third and fourth quartile of hospital prices.

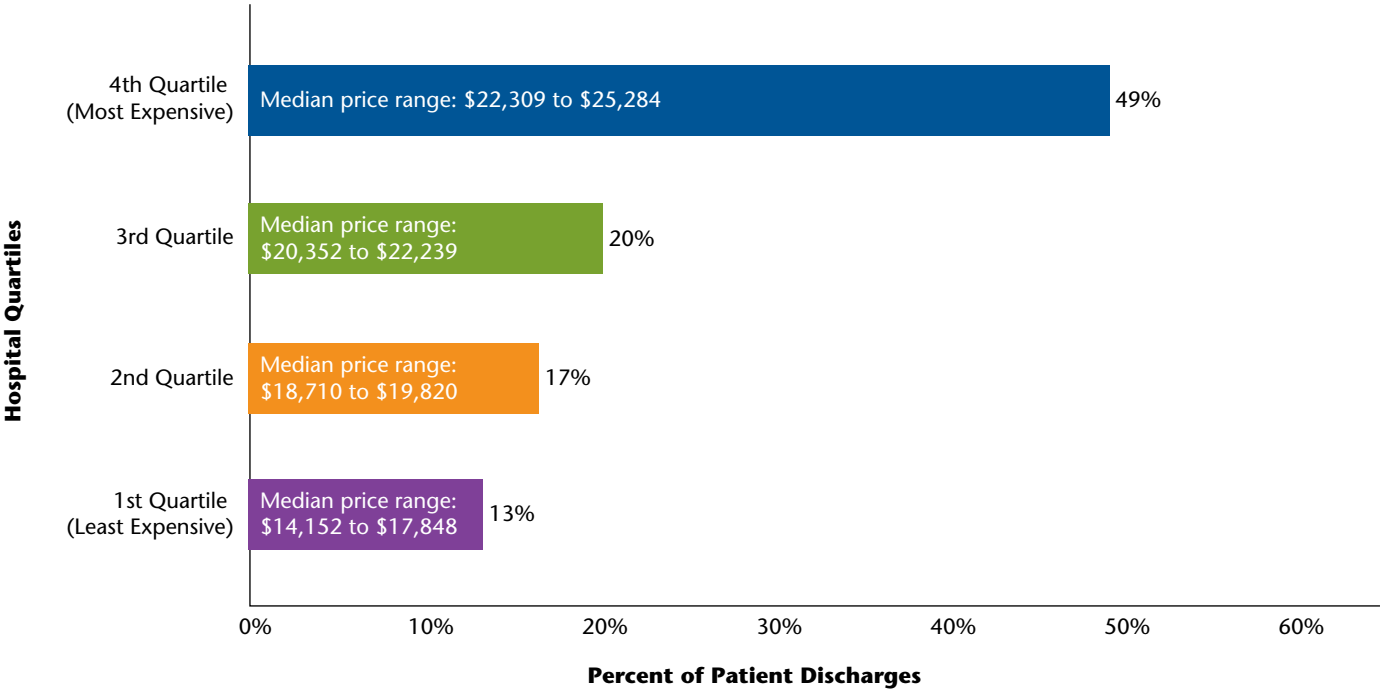
Figure 3: Patient Discharge Volume by Hospital Severity-Adjusted Median Price Quartile Classification (Appendectomy - DRG 225)



Knee Joint Replacements (DRG 302) (Figure 4)

Almost half of knee joint replacement discharges took place at hospitals in the fourth quartile, with median prices ranging from $22,309 to $25,284. The third, second, and first quartiles comprise the remainder of the discharges with 20 percent, 17 percent, and 13 percent of discharges, respectively. Approximately 70 percent of discharges were from hospitals in the third and fourth price quartiles.

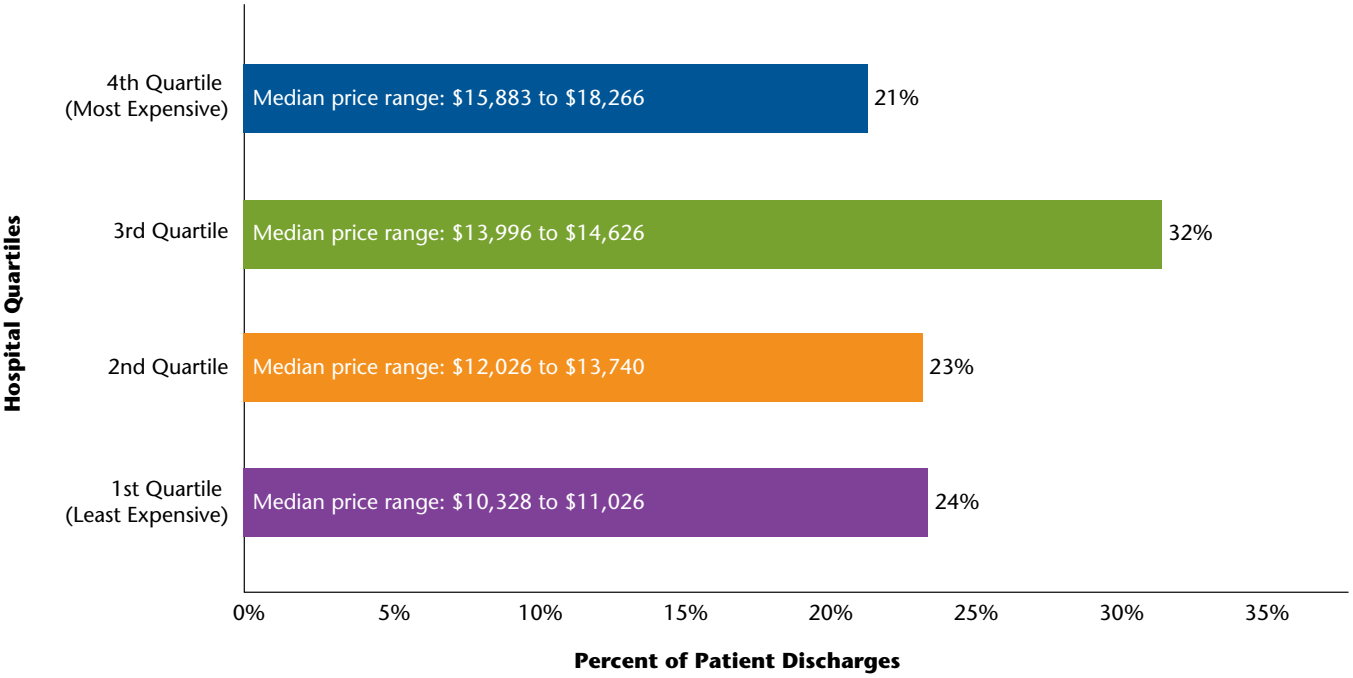
Figure 4: Patient Discharge Volume by Hospital Severity-Adjusted Median Price Quartile Classification (Knee Joint Replacement - DRG 302)



Procedures for Obesity (DRG 403) (Figure 5)

The largest share (32 percent) of the state's discharges for obesity-related procedures took place at hospitals that fell into the third quartile, with median prices ranging from $13,996 to $14,626. The remaining shares of discharges were distributed between hospitals in the first, second, and fourth quartiles with 24 percent, 23 percent and 21 percent of state discharges, respectively.

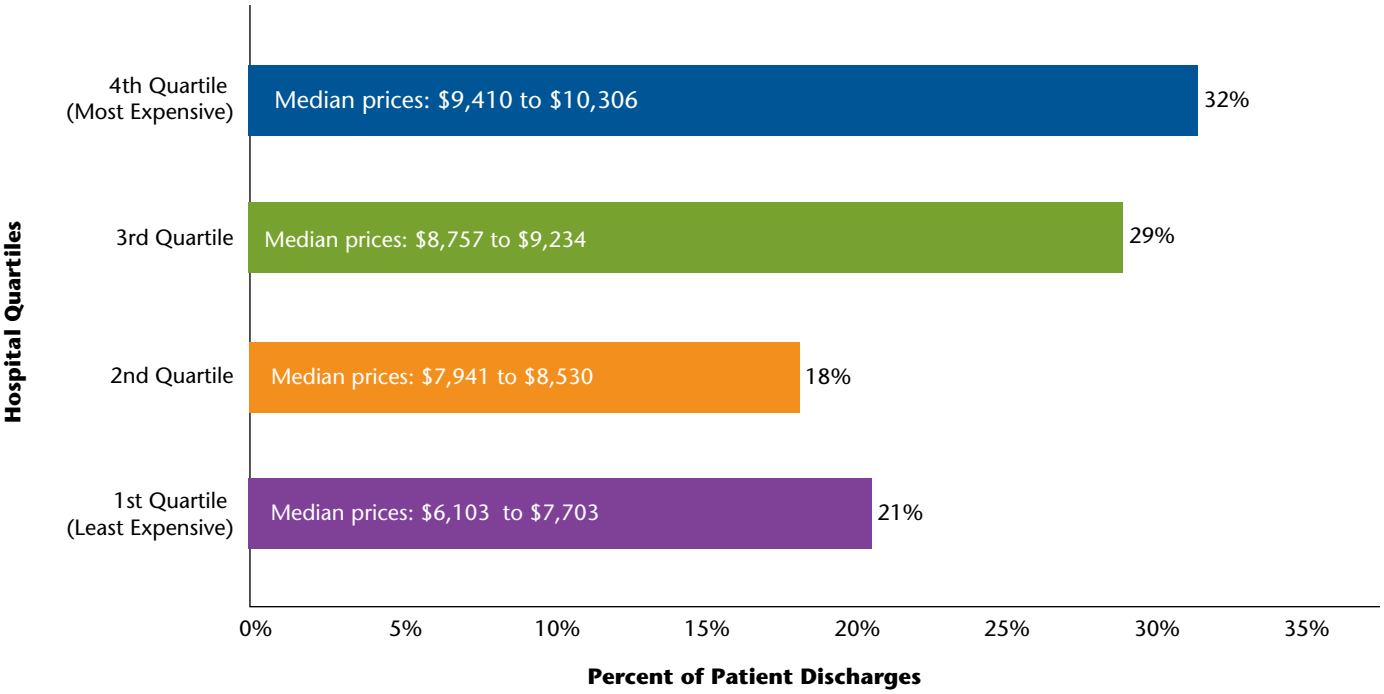
Figure 5: Patient Discharge Volume by Hospital Severity-Adjusted Median Price Quartile Classification (Procedures for Obesity - DRG 403)



Uterine and Adnexa Procedures (DRG 513) (Figure 6)

Discharges for uterine and adnexa procedures were heavily concentrated in the fourth quartile, with 32 percent of state discharges at hospitals with median prices ranging from $9,410 to $10,306. The next greatest share of discharges took place at hospitals in the third quartile, with 29 percent of statewide discharges. The second and first quartiles acquired 18 percent and 21 percent of discharges, respectively. Over 60 percent of discharges were from hospitals in the third and fourth price quartiles.

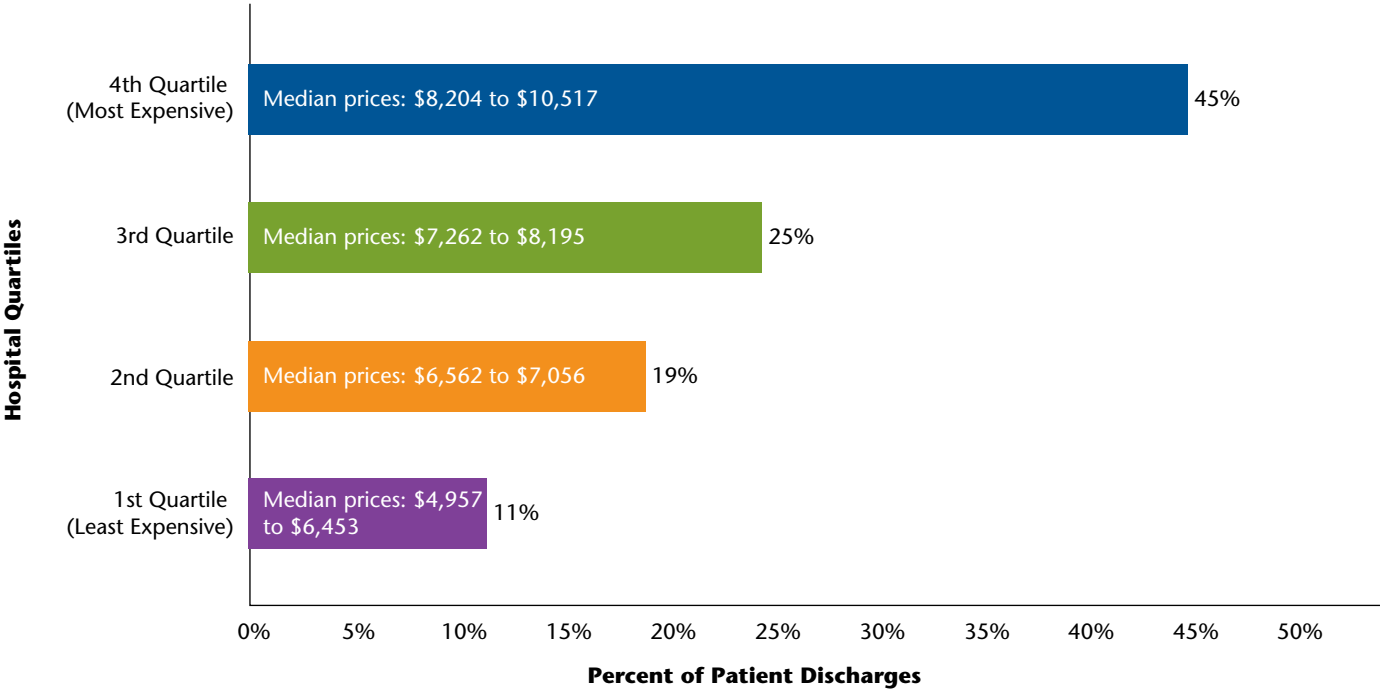
Figure 6: Patient Discharge Volume by Hospital Severity-Adjusted Median Price Quartile Classification (Uterine and Adnexa Procedures for Non-malignancy Except Leiomyoma - DRG 513)



Cesarean Delivery (DRG 540) (Figure 7)

Similar to vaginal deliveries, nearly half (45 percent) of all cesarean deliveries in the state took place at hospitals in the fourth quartile with median prices ranging from $8,204 to $10,517. The remaining share of cesarean delivery discharges in the state were, in descending order of volume, to the third, second, and first quartile of hospitals with 25 percent, 19 percent, and 11 percent of discharges, respectively. The first quartile of hospitals received median prices for cesarean deliveries ranging from $4,957 to $6,453.

Figure 7: Patient Discharge Volume by Hospital Severity-Adjusted Median Price Quartile Classification (Cesarean Delivery - DRG 540)



Section 1.4: Hospital Inpatient Price Variation for Private Payers Compared to Medicaid for Selected DRGs

Method: This analysis compares the private payer severity-adjusted median for each hospital (as computed for sections 1.2 and 1.3) to Medicaid fee schedule rates. The amounts for Medicaid inpatient rates came from the Medicaid Standard Payment Amount per Discharge (SPAD), which is the system that Massachusetts uses to pay for inpatient services. Under the SPAD, the Massachusetts Medicaid program pays each hospital a single amount for every discharge. The SPAD amounts are hospital-specific, but not specific to DRG or patient severity.[18] For this reason, this analysis needed to derive a DRG- and severity-specific SPAD amount for each hospital. This calculation provides an approximate estimate of the amount Medicaid would pay for a particular DRG. As the SPAD relies on prior year case mix data, changes in hospital volume and rate policies may impact the amount the hospital will be paid for a particular case. This analysis cannot be replicated for Medicare because comparable DRGs are not readily available.[19] However, the range in variation across providers for Medicare is compared to the variation for private payers. Additionally, the relative rankings of hospitals are assessed for each payer. The Technical Appendix provides a detailed description of these analytic processes. Hospitals that are included in this analysis are the same as those with at least 30 discharges included in the DRG specific analysis of Section 1.3.

Prices paid for similar services by private payers often vary substantially from those paid by Medicaid and Medicare[20]. Typically, private payers pay higher prices than both Medicaid and Medicare. Some health care providers point to this difference as a justification for increasing private payer prices and the need to negotiate higher rates with private payers. In this section, private payer median prices are compared to fee schedule rates of Medicaid and Medicare to determine the extent of their variation. In addition, this analysis explores the extent to which providers with a higher proportion of public payer patients negotiate relatively higher private payer prices.

How do Private Payer Prices for Inpatient Care Compare to Medicaid Prices (Statewide)?

Table 13 shows the statewide private payer median price across all discharges and the Medicaid median price calculated across individual hospitals as derived from the SPAD. Since these amounts are presented separately by DRG and severity level, no severity adjustment is used.

18 Table 13 in the *Technical Appendix* provides the specific SPAD rate for each hospital.

19 For this analysis, DHCFP used the All Patient Refined grouper. Medicare uses its own version which is not comparable.

20 These prices are based on fee-for-service reimbursement rates and therefore do not include prices paid by Medicaid managed care organizations (MCOs) or Medicare Advantage. Medicaid MCO enrollees make up roughly 50 percent of Medicaid payments in Massachusetts.

Table 13: Median Private Payer Price and Median Medicaid Price, by DRG and Severity of Illness (continued on next page)

Condition and Severity of Illness (SOI)[1]	Private Payer Median Price	Medicaid Median Price[2]	Private Payer Median Price as a % of Medicaid Median Price	Private Payer SOI Discharges as a % of Total DRG Discharges	Medicaid SOI Discharges as a % of Total DRG Discharges
Pneumonia (DRG 139)					
SOI 1	$5,255	$3,193	165	20.6	19.0
SOI 2	$7,278	$4,489	162	51.8	50.5
SOI 3	$12,420	$6,730	185	25.7	25.8
SOI 4	$21,097	$12,506	169	1.9	4.7
Chronic Obstructive Pulmonary Disease (DRG 140)					
SOI 1	$6,592	$3,740	176	31.2	26.1
SOI 2	$7,455	$4,548	164	49.2	48.0
SOI 3	$12,382	$6,304	196	19.6	23.4
SOI 4	N/A[3]	$13,327	N/A	0.0	2.6
Acute Myocardial Infarction (DRG 190)					
SOI 1	$12,391	$4,343	285	32.7	16.9
SOI 2	$14,757	$5,692	259	43.1	40.7
SOI 3	$16,418	$7,760	212	12.7	24.4
SOI 4	$41,814	$13,679	306	11.5	18.0
Congestive Heart Failure (DRG 194)					
SOI 1	$8,400	$3,786	222	19.5	8.7
SOI 2	$11,192	$4,873	230	45.1	40.4
SOI 3	$17,153	$7,475	229	32.8	45.3
SOI 4	$31,109	$15,172	205	2.6	5.6
Appendectomy (DRG 225)					
SOI 1	$7,576	$5,297	143	73.3	67.2
SOI 2	$10,675	$7,883	135	26.7	29.7
SOI 3	N/A	$13,827	N/A	0.0	2.7
SOI 4	N/A	$36,015	N/A	0.0	0.4
Laparoscopic Cholecystectomy (DRG 263)					
SOI 1	$8,648	$5,885	147	61.0	51.1
SOI 2	$11,584	$7,928	146	34.6	37.0
SOI 3	$17,052	$11,528	148	4.4	11.1
SOI 4	N/A	$23,844	N/A	0.0	0.8
Hip Joint Replacement (DRG 301)					
SOI 1	$23,383	$12,060	194	60.2	33.8
SOI 2	$25,039	$13,480	186	36.0	49.3
SOI 3	$32,581	$18,730	174	3.8	14.5
SOI 4	N/A	$28,966	N/A	0.0	2.4

[1] Diagnosis Related Groups (DRGs) and Severity of Illness (SOI) subclasses come from the APR DRG Classification System. An SOI of 1 represents minor illness; 2 represents moderate illness; 3 represents major illness; and 4 represents extreme illness.

[2] Medicaid median price reflects the MassHealth Fee Schedule rates. See the *Technical Apendix* for a detailed description of how the Standard Payment Amount per Discharge (SPAD) was deconstructed to arrive at individual DRG level rates. The median is the median rate across hospitals.

[3] N/A indicates that there were no discharges at the given severity level in the private payer data set during the studied time period

Table 13: Median Private Payer Price and Median Medicaid Price, by DRG and Severity of Illness (continued from previous page)

Condition and Severity of Illness (SOI)[1]	Private Payer Median Price	Medicaid Median Price[2]	Private Payer Median Price as a % of Medicaid Median Price	Private Payer SOI Discharges as a % of Total DRG Discharges	Medicaid SOI Discharges as a % of Total DRG Discharges
Knee Joint Replacement (DRG 302)					
SOI 1	$21,241	$10,921	194	58.2	43.9
SOI 2	$21,887	$12,665	173	39.8	48.8
SOI 3	$28,173	$15,895	177	2.0	7.0
SOI 4	N/A	$29,581	N/A	0.0	0.4
Intervertebral Disc Excision and Decompression (DRG 310)					
SOI 1	$9,471	$5,548	171	74.0	65.6
SOI 2	$11,184	$7,525	149	24.8	29.2
SOI 3	$26,515	$12,171	218	1.3	5.3
SOI 4	N/A	$24,860	N/A	0.0	0.0
Knee and Lower Leg Procedures (DRG 313)					
SOI 1	$11,790	$7,378	160	64.4	46.4
SOI 2	$15,010	$10,689	140	31.4	38.0
SOI 3	$31,908	$19,057	167	4.2	12.7
SOI 4	N/A	$39,253	N/A	0.0	3.0
Procedures for Obesity (DRG 403)					
SOI 1	$13,102	$9,243	142	67.9	56.1
SOI 2	$14,022	$9,417	149	31.1	39.0
SOI 3	$24,552	$13,598	181	1.0	4.8
SOI 4	N/A	$72,081	N/A	0.0	0.0
Uterine and Adnexa Procedures for Non-Malignancy Except Leiomyoma (DRG 513)					
SOI 1	$8,542	$5,257	162	74.3	72.6
SOI 2	$9,826	$6,605	149	25.2	24.0
SOI 3	$16,798	$10,248	164	0.5	3.4
SOI 4	N/A	$38,030	N/A	0.0	0.0
Cesarean Delivery (DRG 540)[4]					
SOI 1	$7,598	$5,652	134	70.2	66.2
SOI 2	$8,718	$7,001	125	24.0	25.0
SOI 3	$11,389	$11,174	102	5.7	8.2
SOI 4	$17,134	$19,742	87	0.1	0.6
Vaginal Delivery (DRG 560)[4]					
SOI 1	$4,990	$3,838	130	62.7	60.9
SOI 2	$5,692	$4,412	129	33.1	33.1
SOI 3	$6,450	$6,664	97	4.1	5.9
SOI 4	N/A	$9,567	N/A	0.0	0.1

[1] Diagnosis Related Groups (DRGs) and Severity of Illness (SOI) subclasses come from the APR DRG Classification System. An SOI of 1 represents minor illness; 2 represents moderate illness; 3 represents major illness; and 4 represents extreme illness.

[2] Medicaid median price reflects the MassHealth Fee Schedule rates. See the *Technical Appendix* for a detailed description of how the Standard Payment Amount per Discharge (SPAD) was deconstructed to arrive at individual DRG level rates. The median is the median rate across hospitals.

[3] N/A indicates that there were no discharges at the given severity level in the private payer data set during the studied time period.

[4] Excludes the cost of neonatal care for both private payers and Medicaid.

Generally, private payer prices are higher than calculated Medicaid prices. The two notable exceptions include cesarean delivery (DRG 540) and vaginal delivery (DRG 560), in which the calculated Medicaid prices for the highest severity levels are more than the median private payer prices.

The greatest differences in private payer prices and Medicaid prices occurred for acute myocardial infarction (DRG 190) and congestive heart failure (DRG 194), where the private payer median price was two to three times the Medicaid price. For orthopedic surgeries such as hip and knee joint replacement, private payer prices were approximately twice the Medicaid payment amount.

Table 13 also displays the distribution of payments across severity levels. The distributions are similar between private payer and Medicaid, with the majority of discharges at severity level 1 or 2 and only slightly more severity level 4 cases in Medicaid.

How do Private Payer Prices for Inpatient Care Compare to Medicaid by Hospital?

Tables 14 and 15 highlight contrasting results for private payer and Medicaid price comparisons by hospital. The dollar amounts shown are severity-adjusted median payments. Medicaid prices for each hospital were severity-adjusted using a similar algorithm to that used to produce the private payer severity-adjusted medians. Therefore, each hospital's severity-adjusted median Medicaid price is comparable to its private payer severity-adjusted median price. The *Technical Appendix* provides additional detail on this approach.

As is typical for most of the examined DRGs, private payer prices for uterine and adnexa procedures (DRG 513) were higher than the calculated Medicaid prices at all hospitals, ranging from a low of 12 percent higher at Lowell General Hospital to 70 percent higher at South Shore Hospital (Table 14).

The results for all 14 DRGs are reported in the *Statistical Appendix*, Tables 2.1 through 2.14.

Table 14: Private Pay Prices Compared to Medicaid Rates by Hospital for Uterine and Adnexa Procedures for Non-Malignancy Except Leiomyoma (DRG 513)

Hospital	Private Payer Severity-Adjusted Median Price	Medicaid Severity-Adjusted Rate[1]	Private Payer Price as a % of Medicaid Rate	% of DRG-Specific Discharges that were Medicaid[2]	% of All Discharges that were Medicaid[2]
Lowell General Hospital	$6,103	$5,427	112%	17%	28%
Milford Regional Medical Center	$6,539	$5,604	117%	13%	10%
Mount Auburn Hospital	$6,896	$5,581	124%	3%	8%
Winchester Hospital	$7,237	$5,353	135%	5%	8%
Caritas Good Samaritan Hospital	$7,703	$5,524	139%	17%	17%
Northeast Health Systems	$7,941	$5,352	148%	9%	17%
Hallmark Health Systems	$8,005	$5,523	145%	18%	12%
Newton Wellesley Hospital	$8,061	$5,782	139%	5%	6%
Baystate Medical Center	$8,501	$5,935	143%	21%	29%
North Shore Medical Center	$8,530	$5,552	154%	23%	18%
Southcoast Health Systems Charlton	$8,757	$5,454	161%	20%	21%
Southcoast Health Systems St. Luke's	$8,762	$5,418	162%	29%	25%
Sturdy Memorial Hospital	$8,834	$5,439	162%	13%	14%
South Shore Hospital	$9,078	$5,350	170%	2%	6%
U Mass Memorial Medical Center	$9,234	$6,004	154%	13%	20%
Lahey Clinic	$9,410	$5,687	165%	3%	3%
Beth Israel Deaconess Medical Center	$9,536	$6,159	155%	5%	9%
Brigham & Women's Hospital	$10,149	$6,179	164%	5%	10%
Massachusetts General Hospital	$10,306	$6,276	164%	5%	11%
Range	**($6,103, $10,306)**	**($5,350, $6,276)**			
Statewide median	**$8,530**	**$5,552**	**154%**	**13%**	**12%**
Correlation of Private Payer Price Relativity with % of Discharges that were Medicaid				**-0.18**	**-0.19**
R-squared				**0.03**	**0.04**

[1] Medicaid Severity-Adjusted Rate reflects prices set for Medicaid fee-for-service. "N/A" means that the Severity-Adjusted Rate could not be calculated because the hospital did not have any Medicaid fee-for-service patients in this DRG during the time period studied.

[2] Data for Fiscal Year 2009 (October 2008 through September 2009), including both Medicaid fee-for-service and managed care enrollees.

Higher average private payer prices compared to Medicaid were observed at every hospital for most of the 14 DRGs analyzed, with only two notable exceptions. Private payer prices for both vaginal birth and cesarean birth were lower than Medicaid at several hospitals. As can be seen in Table 15, private payer prices were approximately 85 percent of the calculated Medicaid price for Boston Medical Center, Holyoke Hospital, Cambridge Health Alliance, and Martha's Vineyard Hospital for vaginal birth. On the other hand, for the same service, private payer prices are over 40 percent higher than calculated Medicaid prices at Fairview Hospital, Cooley Dickinson Hospital, and South Shore Hospital.

Table 15: Private Pay Prices Compared to Medicaid Rates by Hospital for Vaginal Delivery (DRG 560)[3] (continued on next page)

Hospital	Private Payer Severity-Adjusted Median Price	Medicaid Severity Adjusted Rate[1]	Private Payer Price as a % of Medicaid Rate	% of DRG-Specific Discharges that were Medicaid[2]	% of All Discharges that were Medicaid[2]
Holyoke Hospital	$3,430	$4,013	85%	67%	26%
Cambridge Health Alliance	$3,490	$4,122	85%	71%	39%
Martha's Vineyard Hospital	$3,530	$4,141	85%	38%	16%
Heywood Hospital	$3,658	$4,136	88%	44%	19%
Lowell General Hospital	$3,770	$4,100	92%	50%	28%
Anna Jaques Hospital	$3,780	$4,072	93%	29%	14%
Mercy Medical Center	$3,805	$3,889	98%	59%	22%
Milford Regional Medical Center	$3,821	$4,225	90%	31%	10%
Brockton Hospital	$3,874	$4,084	95%	62%	25%
Sturdy Memorial Hospital	$3,924	$4,128	95%	29%	14%
Caritas Norwood Hospital	$4,067	$4,136	98%	23%	7%
Saint Vincent Hospital	$4,073	$4,346	94%	33%	14%
Morton Hospital	$4,077	$4,063	100%	55%	18%
Cape Cod Hospital	$4,137	$4,308	96%	43%	10%
Boston Medical Center	$4,285	$5,093	84%	80%	41%
Mount Auburn Hospital	$4,298	$4,255	101%	16%	8%
Falmouth Hospital	$4,381	$4,296	102%	36%	10%
Caritas Holy Family Hospital	$4,392	$4,023	109%	48%	23%
Winchester Hospital	$4,398	$4,182	105%	14%	8%
Jordan Hospital	$4,425	$4,280	103%	30%	10%
Metrowest Medical Center	$4,434	$4,203	105%	37%	15%
Health Alliance Hospitals, Inc.	$4,464	$4,108	109%	44%	21%

[1] Medicaid Severity-Adjusted Rate reflects prices set for Medicaid fee-for-service. "N/A" means that the Severity-Adjusted Rate could not be calculated because the hospital did not have any Medicaid fee-for-service patients in this DRG during the time period studied.

[2] Data for Fiscal Year 2009 (October 2008 through September 2009), including both Medicaid fee-for-service and managed care enrollees.

Table 15: Private Pay Prices Compared to Medicaid Rates by Hospital for Vaginal Delivery (DRG 560)[3] (continued from previous page)

Hospital	Private Payer Severity-Adjusted Median Price	Medicaid Severity Adjusted Rate[1]	Private Payer Price as a % of Medicaid Rate	% of DRG-Specific Discharges that were Medicaid[2]	% of All Discharges that were Medicaid[2]
Harrington Memorial Hospital	$4,491	$4,239	106%	54%	22%
Lawrence General Hospital	$4,559	$4,442	103%	50%	24%
Emerson Hospital	$4,593	$4,133	111%	9%	5%
Tufts Medical Center	$4,670	$4,646	101%	46%	23%
Baystate Medical Center	$4,682	$4,516	104%	53%	29%
North Adams Regional Hospital	$4,701	$3,762	125%	54%	26%
Hallmark Health Systems	$4,747	$4,169	114%	30%	12%
Caritas Good Samaritan Hospital	$4,749	$4,092	116%	63%	17%
Northeast Health Systems	$4,924	$4,095	120%	33%	17%
Newton Wellesley Hospital	$4,938	$4,297	115%	6%	6%
Southcoast Health Systems St. Luke's	$4,987	$4,127	121%	64%	25%
Southcoast Health Systems Charlton	$5,102	$4,091	125%	57%	21%
Southcoast Health Systems Tobey	$5,135	$4,106	125%	41%	19%
Baystate Franklin Medical Center	$5,274	$3,869	136%	44%	21%
North Shore Medical Center	$5,371	$4,219	127%	48%	18%
Beth Israel Deaconess Medical Center[3]	$5,413	$4,677	116%	12%	9%
Berkshire Medical Center	$5,580	$4,494	124%	56%	19%
Fairview Hospital	$5,651	$3,979	142%	54%	18%
Cooley Dickinson Hospital	$5,664	$3,883	146%	28%	13%
U Mass Memorial Medical Center	$5,781	$4,696	123%	37%	20%
Brigham & Women's Hospital	$5,943	$4,931	121%	14%	10%
South Shore Hospital	$5,955	$4,098	145%	10%	6%
Massachusetts General Hospital	$6,146	$4,936	124%	22%	11%
Caritas St. Elizabeth's Medical Center	$6,185	$4,598	135%	22%	11%
Range	**($3,430, $6,185)**	**($3,762, $5,093)**			
Statewide median	**$4,525**	**$4,139**	**106%**	**42%**	**18%**
Correlation of Private Payer Price Relativity with % of Discharges that were Medicaid				**-0.33**	**-0.29**
R-squared				**0.11**	**0.08**

[1] Medicaid Severity-Adjusted Rate reflects prices set for Medicaid fee-for-service. "N/A" means that the Severity-Adjusted Rate could not be calculated because the hospital did not have any Medicaid fee-for-service patients in this DRG during the time period studied.

[2] Data for Fiscal Year 2009 (October 2008 through September 2009), including both Medicaid fee-for-service and managed care enrollees.

[3] Excludes the cost of neonatal care for both private payers and Medicaid.

Do Hospitals with a Higher Proportion of Medicaid Discharges Negotiate Higher Private Payer Prices?

Providers occasionally cite Medicaid's lower payments for services as a key factor underlying private payer price variation, arguing that hospitals must negotiate higher private payments to offset low public payer payments. In order to determine whether this assertion is supported by evidence, Medicaid and private payer price relativities were examined, as well as the percent of Medicaid discharges for the selected DRGs and each hospital's overall proportion of Medicaid discharges. Correlations[21] were developed between the private payer price relativity and the proportion of Medicaid patients discharged from the hospital.

As noted in Tables 14 and 15, no correlation was found between private payer price relativities using either the overall Medicaid discharge proportion or the DRG-specific Medicaid discharge proportion. The R-squared values, which indicate the percentage of the price variation that can be explained by the Medicaid proportion of discharges, indicated a very weak or no relationship.[22] See the *Statistical Appendix*.

- In fact, two of the hospitals with the highest proportion (67 percent and 71 percent) of Medicaid vaginal birth discharges had the lowest private payer prices for vaginal birth (Holyoke Hospital and Cambridge Health Alliance).
- The two hospitals with the highest relative private payer prices had a proportion of Medicaid patients for vaginal birth only just over 20 percent (Table 15).
- A similar result, or lack of relationship, was found for the other thirteen DRGs and is shown in Tables 2.1 through 2.14 of the *Statistical Appendix*.

Do Medicare and Medicaid Prices Vary Across Hospitals in a Similar Way as Private Payer Prices?

For Medicaid, differences in payment rates across providers are relatively narrow and reflect differences in pass-throughs (adjustments for organ acquisition, malpractice, and limited teaching status) and wage differentials.

Medicare factors in several components into rates, including adjustments for area wages, indirect medical education, treating a disproportionate share of low income patients, cases that involve certain approved high cost new technologies, and high cost outlier payments.[23] After controlling for DRGs, the payment variation across hospitals for Medicare reflects only these factors.

Medicare payment rates cannot be directly compared to private payer payments as was done with Medicaid. However, this analysis did compare the range in Medicare payments and the relative ranking of each hospital for vaginal delivery (DRG 560), which had the most hospitals with more than 30 private payer discharges. DRG 560 also represents the largest proportion of private payer inpatient services and payments.[24]

21 Pearson's correlation test.

22 One exception is CHF (DRG 194), in which the correlation is driven by the fact that there are only four observations for the DRG.

23 Medicare Payment Advisory Commission, *Medicare Payment Basics: Hospital Acute Inpatient Services Payment System*, October 2010. Available at: http://www.medpac.gov/documents/MedPAC_Payment_Basics_10_hospital.pdf, accessed 5/22/2011.

24 This particular DRG is not prevalent in the Medicare population. However, this analysis calculated a Medicare price relativity controlling for DRG, which means that DRG weights are held constant so the price relativity across hospitals are the same for all DRGs.

Table 16 shows a Medicare price relativity that reflects the aforementioned factors compared to the private payer price relativity for DRG 560. Medicare and private payers show a similar breadth in range of payments with ratios of highest to lowest payments of 1.9 and 1.8, respectively.

Table 16. Comparison of Hospital Price Relativity Rankings for Medicare and Private Payers

(continued on next page)

Hospitals	Price Relativity for Medicare Price (non-specific DRG)	Medicare Rank (Lowest Paid = 1)	Price Relativity for Private Pay Price (DRG 560 example)	Private Payer Rank (Lowest Paid = 1)
Cooley Dickinson Hospital	0.86	1	1.25	39
North Adams Regional Hospital	0.87	2	1.04	27
Emerson Hospital	0.88	3	1.01	24
Winchester Hospital	0.89	4	0.97	18
Baystate Franklin Medical Center	0.91	5	1.17	35
Caritas Norwood Hospital	0.92	6	0.90	10
South Shore Hospital	0.92	7	1.32	42
Sturdy Memorial Hospital	0.92	8	0.87	9
Jordan Hospital	0.92	9	0.98	19
Milford Regional Medical Center	0.93	10	0.84	7
Holyoke Hospital	0.94	11	0.76	1
Anna Jaques Hospital	0.96	12	0.84	5
Northeast Health Systems	0.97	13	1.09	30
Falmouth Hospital	0.97	14	0.97	16
Newton Wellesley Hospital	0.98	15	1.09	31
Hallmark Health Systems	0.98	16	1.05	28
Morton Hospital	0.98	17	0.90	12
Southcoast Health Systems Charlton	0.98	18	1.13	33
Southcoast Health Systems St. Luke's	0.98	19	1.10	32
Southcoast Health Systems Tobey	0.98	20	1.13	34
Caritas Holy Family Hospital	0.99	21	0.97	17
Harrington Memorial Hospital	0.99	22	0.99	22
Metrowest Medical Center	1.01	23	0.98	20
Mercy Medical Center	1.01	24	0.84	6

Table 16. Comparison of Hospital Price Relativity Rankings for Medicare and Private Payers
(continued from previous page)

Hospitals	Price Relativity for Medicare Price (non-specific DRG)	Medicare Rank (Lowest Paid = 1)	Price Relativity for Private Pay Price (DRG 560 example)	Private Payer Rank (Lowest Paid = 1)
North Shore Medical Center	1.02	25	1.19	36
Heywood Hospital	1.03	26	0.81	3
Health Alliance Hospitals, Inc.	1.04	27	0.99	21
Lowell General Hospital	1.04	28	0.83	4
Berkshire Medical Center	1.07	29	1.23	38
Caritas Good Samaritan Hospital	1.07	30	1.05	29
Mount Auburn Hospital	1.09	31	0.95	15
Saint Vincent Hospital	1.10	32	0.90	11
Brockton Hospital	1.11	33	0.86	8
Lawrence General Hospital	1.12	34	1.01	23
Cape Cod Hospital	1.15	35	0.91	13
Baystate Medical Center	1.22	36	1.03	26
Massachusetts General Hospital	1.32	37	1.36	43
Cambridge Health Alliance	1.33	38	0.77	2
U Mass Memorial Medical Center	1.36	39	1.28	40
Brigham & Women's Hospital	1.37	40	1.31	41
Caritas St. Elizabeth's Medical Center	1.42	41	1.37	44
Beth Israel Deaconess Medical Center	1.45	42	1.20	37
Tufts Medical Center	1.53	43	1.03	25
Boston Medical Center	1.64	44	0.95	14
Minimum	0.86		0.76	
Maximum	1.64		1.37	
Ratio	1.91		1.80	
Correlation Coefficient on Ranks	0.1032			
R-squared	0.0106			

However, the hospitals that are paid higher by Medicare are not necessarily higher paid by private payers and vice versa. Out of the 44 hospitals shown, Medicare pays the highest rates to Boston Medical Center and Tufts Medical Center and the lowest rates to Cooley Dickinson Hospital and North Adams Regional Hospital. The disproportionate share of low income patients and indirect medical education components factor heavily in the higher rankings for Boston Medical Center and Tufts Medical Center. On a scale from the lowest paid (rank 1) to highest paid (rank 44) hospital, Boston Medical Center ranks 44 out of 44 for Medicare but 14 for private payers. Similarly, while Cooley Dickinson Hospital is the lowest paid Medicare hospital (ranked 1), it ranks 39 on the private payer scale. A Pearsons correlation indicates there is no correlation between the private payer payment ranking and Medicare payment ranking, showing an R-square of about one percent.

Section 1.5: Potential Models of Reduced Price Variation

Method: Similar to the analysis presented in Section 1.1, the modeled scenarios and the underlying distributions are based on the statewide distribution of actual payments made for each discharge regardless of where the discharge occurred. This analysis is based only on private payer data. The severity adjustment process and hospital specific price relativities are not used. Rather, the scenarios (including the percentiles required to model each scenario) are calculated separately by DRG and severity level. The results for each severity level are then summed to produce a single potential savings amount for each DRG and modeled scenario. The total dollar savings are extrapolated from the studied sample of DRGs based on data from DHCFP's 2010 cost trends report.[25] According to that study, inpatient expenditures accounted for 17 percent of total private payer expenditures in 2008, and overall total expenditures was $13 billion for the studied carriers. Those carriers represented 65 percent of the market. Inflating $13 billion to 100 percent of the market yields estimated total private payer expenditures of $20 billion, of which the inpatient expenditures would be approximately $3.4 billion. The Technical Appendix provides a more detailed description on how these estimates were derived.

25 Massachusetts Division of Health Care Finance and Policy, *Massachusetts Health Care Cost Trends, Part III: Health Spending Trends for Privately Insured 2006-2008, Technical Report*, February 2010. Available at: http://www.mass.gov/Eeohhs2/docs/dhcfp/r/cost_trends_files/part3_health_spending_trends_technical_report.pdf, accessed 5/22/2011.

Potential Savings Simulations

Several simulations of reduced price variation were conducted to understand the potential impact on health care spending. Specifically, the analysis considered four models for each of the selected DRGs and severity levels:

- Payments were paid at the 2009 median price;
- All payments above the existing 80th percentile were instead made at the 80th percentile;
- The range of payments were narrowed to the existing 20th percentile and 80th percentile; and
- Payments below the existing 20th percentile were instead made at the 20th percentile.

Across all of the selected DRGs, the greatest impact on total payments would occur if private payer prices above the 80th percentile were instead made at the 80th percentile within each severity category. This model would have reduced total inpatient payments by 5 percent in 2009 for the selected DRGs (Table 17). Assuming that these DRGs are representative of all inpatient expenditures, and assuming that the experience of these major carriers is similar to the experience of other carriers in the private payer market, the total estimated savings for inpatient care in the privately insured market would be approximately $170 million out of the total estimated $3.4 billion in total private payer inpatient expenditures.

Even scenarios which include an increase in payments made below a certain threshold, in this case the 20th percentile, would result in savings when coupled with a decrease in the upper percentile range. If the highest payments were made at the 80th percentile of prices but the lowest payments were made at the 20th percentile, more than $88 million in estimated savings would result. Alternatively, if the lower end of payments were increased to the 20th percentile without a corresponding decrease in upper end payments, the result would be an overall increase of 2.4 percent or $80 million.

The modeled scenarios are presented as a way to quantify the impact of narrowing the range in provider price variation. These examples serve as a starting point for discussion about options and impacts, but are not meant to advocate specific interventions.

Table 17: Total Payments for Selected High-Volume DRGs and Simulated Change with Alternative Payment Levels by Severity of Illness, 2009

APR-DRG	All payments made at the median	Payments above the 80th percentile reduced to the 80th percentile	All payments made between the 20th and 80th percentile	Payments below the 20th percentile increased to the 20th percentile
Total, all selected DRGs				
Percent change in payments	-3.3%	-5.0%	-2.6%	2.4%
Selected surgical DRGs				
Laparoscopic cholecystectomy (263)	-2.1%	-4.7%	-1.1%	3.6%
Procedures for obesity (403)	1.2%	-3.2%	-0.7%	2.4%
Uterine and adnexa procedures for nonmalignancy except leiomyoma (513)	-0.8%	-3.8%	-1.1%	2.7%
Appendectomy (225)	-3.1%	-5.9%	-2.1%	3.7%
Selected DRGs related to musculoskeletal procedures				
Knee joint replacement (302)	-2.1%	-5.1%	-3.1%	2.1%
Intervertebral disc excision and decompression (310)	-2.7%	-5.8%	-2.7%	3.1%
Knee and lower leg procedures (313)	-2.9%	-4.6%	-1.7%	3.0%
Hip joint replacement (301)	1.1%	-4.5%	-2.5%	2.0%
Selected medical DRGs				
Chronic obstructive pulmonary disease (140)	-8.0%	-7.1%	-4.9%	2.2%
Pneumonia (139)	-6.1%	-7.9%	-5.2%	2.8%
Acute myocardial infarction (190)	-12.1%	-10.9%	-8.3%	2.6%
Congestive heart failure (194)	-7.9%	-9.3%	-5.6%	3.7%
Selected maternity DRGs				
Cesarean delivery (540)	-5.0%	-4.5%	-2.5%	2.0%
Vaginal delivery (560)	-4.9%	-4.2%	-2.1%	2.1%

Source: Mathematica Policy Research analysis of private insured and self-insured fee-for-service claims for Massachusetts residents.

Note: Payments include patient cost sharing in fee-for-service coverage. Payments made under managed care contracts are not included. Estimates are derived from calculation of percentiles within each severity level for each DRG and aggregated to the DRG. Savings represent inpatient services only, which represented approximately 17% of total private payer healthcare expenditures in 2008, as reported in *Massachusetts Health Care Cost Trends, Part III: Health Spending Trends for Privately Insured 2006-2008, Technical Report* (February 2010).

Section 1.6: Price Variation and Quality for Inpatient Care at Massachusetts Hospitals

Method: In this section, the "price relativities" that were used throughout Section 1.3 are compared to similar "quality relativities" to identify relationships. The quality relativities were created similarly to the price relativities by comparing each hospital's quality score to the average hospital quality score and creating a ratio. The quality score relies on existing quality measures that are publicly reported, and are directly related to the analyzed DRG. Using pneumonia as an example, quality metrics that include process measures specific to pneumonia, readmission rates for pneumonia, mortality rates for pneumonia, as well as patient experience measures were combined to yield a composite pneumonia score. The quality relativity is then compared to the price relativity to explore the relationship between the variation in the private payer prices and selected quality measures for 14 common DRGs. The calculations are reported in the Technical Appendix.

Measuring health care quality is a complex process informed by various considerations of audience, purpose, and feasibility. The methodology and measure must address issues such as whether the information will be derived from accurate data, whether it will provide stable and reliable results, whether the information will be actionable for providers seeking to improve quality of care, and whether the information will be useful and accessible to consumers and purchasers seeking to make decisions about how or where to obtain health care.

The set of measures that are currently used in consumer reporting, quality improvement, and pay-for-performance arrangements are acknowledged by some to be limited in their scope and relevance to the decisions faced by patients, providers, and policymakers. However, increasing the use and availability of quality measures could be a catalyst in improving the effectiveness and safety of the health care delivery system. Although the extent of consumer utilization of the comparative quality information available is debated, research by the Kaiser Family Foundation has reported a consistent trend in the proportion of consumers who would prefer a highly rated health plan or provider over one recommended by friends.[26] Despite the limitations in quality measurement, there is also movement in government, at both the state and federal levels, to encourage health system redesign that acknowledges value. Specifically, the Centers for Medicaid and Medicare Services (CMS) value-based purchasing program currently in development seeks to reward hospitals that perform well on quality measures relating both to clinical process of care and to patient experience of care, or those making improvements in their performance on those measures.

The following analysis is not intended to make broad assertions regarding overall health care quality in Massachusetts. Instead, it draws limited conclusions regarding specific processes and care outcomes based on comparisons of data for which currently reported quality measures are available. As the science of quality measurement continues to improve, similar analyses will be able to draw more general conclusions about overall health care service quality among the state's hospitals and to draw clearer conclusions about the relationship between price and quality. The detailed methodology used to analyze health care quality in this report is provided in the *Technical Appendix*.

26 Kaiser Family Foundation, *2008 Update on Consumers' Views of Patient Safety and Quality Information*, October 15, 2008. Available at: http://www.kff.org/kaiserpolls/posr101508pkg.cfm, accessed 5/22/2011.

Massachusetts Hospital Quality Performance Compared to the Nation

On average, Massachusetts hospitals' statewide performance on a majority of quality measures that relate to the care received by Medicare patients has historically been better than the national average.[27] Recommended care processes for heart attack, heart failure, pneumonia, and surgical care improvement are delivered on average 96 percent of the time in Massachusetts, compared to 95.4 percent nationwide during the reporting period.[28] Massachusetts hospitals also tend to score better than hospitals around the nation on composite process of care metrics. For example, the composite score on process of care for heart attack patients is 98.4 percent in Massachusetts, compared to 97.3 percent nationwide.

Massachusetts also compares favorably to the nation on 30-day mortality rate measures for various conditions. Among Massachusetts hospitals, the 30-day mortality rate after discharge from the hospital was 15.2 percent for heart attack, 10.1 percent for heart failure, and 10.5 percent for pneumonia compared to 16.2, 11.3, and 11.7 percent, respectively, for hospitals across the nation during the reporting period.[29]

Patient satisfaction is typically measured using the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS), a standardized survey instrument and data collection methodology for measuring patients' perspectives on hospital care.[30] Collectively, Massachusetts hospitals receive higher patient satisfaction for the majority of patient experience dimensions (seven out of ten questions) than the national average.[31] The comparison on patient experience between hospitals in Massachusetts and hospitals nationwide is summarized in Table 18.

27 See: Commonwealth Fund analysis of Hospital Compare data including process-of-care measures, patient satisfaction measures (from the Hospital Consumer Assessment of Healthcare Providers and Systems), readmission rates, and mortality rates. Available at: www.whynotthebest.org, accessed 5/22/2011. Note that individual hospital performance may vary from the state average.

28 Commonwealth Fund, *Map of Performance on Selected WhyNotTheBest.org Measures*, 2011. Reporting period April 1, 2009 – March 31, 2010. Available at: http://www.whynotthebest.org/pages/maps, accessed 5/22/2011.

29 Commonwealth Fund, *Map of Performance on Selected WhyNotTheBest.org* Measures, 2011. Reporting period was July 1, 2006 – June 30, 2009. Available at: http://www.whynotthebest.org/pages/maps, accessed 5/22/2011.

30 The HCAHPS survey is composed of eight key aspects of consumers' hospital experience: communication with doctors; communication with nurses; responsiveness of hospital staff; cleanliness and quietness of hospital environment; pain management; communication about medicines and related discharge information; and two consumer-generated overall ratings: overall rating of hospital and recommendation of hospital.

31 Commonwealth Fund, *Map of Performance on Selected WhyNotTheBest.org Measures*, 2011. Reporting period was July 1, 2006 – June 30, 2009. Available at: http://www.whynotthebest.org/pages/maps, accessed 5/22/2011.

Table 18: Massachusetts Average Performance on Patient Experience Measures Compared to the National Average

	Massachusetts Average	US Average
Doctors always communicated well	79.3%	80.1%
Nurses always communicated well	77.5%	75.5%
Patients always received help as soon as they wanted it	63.5%	63.6%
Staff always explained medicines	61.8%	59.9%
Pain always well controlled	71.4%	69.1%
Patient's room always kept quiet at night	50.6%	57.7%
Patient's room and bathroom always kept clean	71.6%	70.8%
Patients given information about recovery at home	85.4%	81.5%
Patients would definitely recommend this hospital to friends and family	73.2%	70.0%
Perception of the hospital (percent of patients highly satisfied)	67.4%	66.7%

Source: Commonwealth Fund, reporting period April 2009 to March 2010.

Although Massachusetts hospitals tend to have above-average quality ratings on recommended care, process of care, mortality, and patient satisfaction, Massachusetts hospital readmission rates compare less favorably to hospitals around the nation. Massachusetts hospitals have higher average readmission rates for heart attack and pneumonia patients than nationwide. Among Massachusetts hospitals, the 30-day readmission rate after discharge from the hospital is 20.4 percent for heart attack, 25.2 percent for heart failure, and 19.1 percent for pneumonia compared to 20.0 percent, 24.7 percent, and 18.3 percent, respectively, for hospitals across the nation during the same reporting period.[32] Massachusetts's higher average readmission rates present an opportunity for improved care coordination, which will in turn facilitate better patient outcomes and cost savings.

32 Ibid.

Variation in Massachusetts Hospital Quality

There was very little measureable variation in quality among Massachusetts hospitals for the selected 14 DRGs using the available quality metrics. In fact, out of 72 hospitals, only 11 hospitals scored significantly better or worse than average on at least one DRG aggregate quality measure, indicating that Massachusetts hospitals tended to have remarkably similar and consistent quality results on these specific quality measures (Table 19). Alternatively, this result may also indicate that these publicly available measures are not sensitive enough to discern difference amongst Massachusetts hospitals. Table 3 in the *Statistical Appendix* provides hospital-specific quality relativities for each of the 14 DRGs.

Table 19: Hospitals with Quality Measures Showing Statistically Significant Difference

(continued on next page)

	DRG Quality Relativities[1]													
Hospital	**139[4]**	**140[2]**	**190**	**194**	**225**	**263**	**301**	**302**	**310**	**313**	**403**	**513**	**540**	**560**
Scored Above Average														
Baystate Mary Lane Hospital	1.02	1.08	1.01	1.03	1.03*	1.03*	1.03*	1.03*	1.03*	1.03*	1.03*	1.03*	1.03*	1.03
Clinton Hospital	1.02	1.13*	N/A[3]	1.04*	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	N/A	N/A
Fairview Hospital	1.03*	1.12*	1.04*	1.04*	1.04*	1.04*	1.04*	1.04*	1.04*	1.04*	1.04*	1.04*	1.04	1.04
Faulkner Hospital	1.01	1.04	1.01	1.02	1.03*	1.03*	1.03*	1.03*	1.03*	1.03*	1.03*	1.03*	N/A	N/A
Milford Regional Medical Center	1.01	1.05	1.01	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.05*
New England Baptist Hospital	1.02	1.05	N/A	1.03	1.03*	1.03*	1.03*	1.03*	1.03*	1.03*	1.03*	1.03*	N/A	N/A
Tufts Medical Center	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.06*

[1,2,3,4,*] See notes on page 47.

Table 19: Hospitals with Qualiy Measures Showing Statistically Significant Difference (continued from previous page)

Hospital		DRG Quality Relativities[1]												
		139[4]	140[2]	190	194	225	263	301	302	310	313	403	513	540	560
Scored Below Average															
Berkshire Medical Center		1.01	0.99	1.00	1.02	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.94*
Harrington Memorial Hospital		0.98	0.99	0.99	0.96*	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.96
Lawrence General Hospital		0.98	0.96	0.98	0.96*	0.96*	0.96*	0.96*	0.96*	0.96*	0.96*	0.96*	0.96*	0.96*	0.98
Quincy Medical Center		0.97	0.92	0.98	0.98	0.96*	0.96*	0.96*	0.96*	0.96*	0.96*	0.96*	0.96*	N/A	N/A
Total	**Above Average**	1	2	1	2	4	4	4	4	4	4	4	4	1	2
	Below Average	0	0	0	2	2	2	2	2	2	2	2	2	1	1

[1] The quality relativity was computed by dividing the hospital's performance rate by the statewide average. A relativity of 1.0 is average, and higher numbers indicate better performance. A relativity of 1.10, for example, indicates that the hospital performs 10% better than average on the measure. The relativities for each quality component were then averaged together, giving an aggregate relativity indicating the weighted-average performance for each hospital for each DRG examined. This aggregate relativity can be used to gauge each hospital's relative performance for each DRG.

[2] Quality scores for COPD rely solely on patient experience scores.

[3] N/A denotes that an aggregate quality relativity was not available for a given hospital's performance for the DRG indicated. This may be due to sample sizes that are too small to derive a meaningful quality relativity, missing data, or if a hospital does not provide a given service. For more information about how missing data was handled in the calculation of quality scores, please see the *Technical Appendix*.

* Denotes a relativity score that is statistically significantly above or below the median. Statistical significance was derived from the Z-Score, or standardized score, for each hospital's DRG-specific aggregate quality relativity. The standardized score indicates how many standard deviations a score is above or below average. An average standardized score is zero. Positive values indicate better performance. Z-Scores greater than 1.96 indicate performance that is 2 or more standard deviations better than average, which would be considered statistically significant ($p<0.05$). Similarly, Z-Scores of less than -1.96 indicate significantly worse than average performance. Z-Score values can be found in Tables 4.1 through 4.6 in the *Statistical Appendix*.

[4] DRG Key	
139 - Pneumonia	302 - Knee joint replacement
140 - Chronic obstructive pulmonary disease (COPD)	310 - Intervertebral disc excision and decompression
190 - Acute myocardial infarction (AMI)	313 - Knee and lower leg procedures
194 - Congestive heart failure (CHF)	403 - Procedures for obesity
225 - Appendectomy	513 - Uterine and adnexa procedures for non-malignancy except leiomyoma
263 - Laparoscopic cholecystectomy	540 - Cesarean delivery
301 - Hip joint replacement	560 - Vaginal delivery

The range in composite quality scores for each of the 14 DRGs was relatively narrow, with hospitals typically falling within 4 percentage points of the median. The widest range in quality scores occurred for the DRGs with the fewest independent quality measures within the composite. For chronic obstructive pulmonary disorder (DRG 140) where the quality score is based solely on patient experience measures, the lowest ranked hospital had a quality relativity of 0.92 (8 percent below the median score) and the highest ranked hospital had a quality relativity of 1.13 (13 percent above the median score). Table 20 shows the range in the quality relativities for each of the quality domains used in this analysis. See *Statistical Appendix* Tables 4.1 through 4.7 for a detailed breakdown of the hospital-specific quality relativities for each of the quality domains.

Table 20: Range in Hospital Quality Relativity by Measure Domain

	Aggregate Quality Relativity	
	Minimum	Maximum
Patient Experience (HCAHPS)	0.92	1.13
Surgical Process	0.85	1.03
Surgical PSI	0.96	1.04
Vaginal Delivery PSI	0.92	1.08
Pneumonia		
Process	0.79	1.04
Readmissions	0.95	1.04
Mortality	0.95	1.04
Acute Myocardial Infarction (AMI)		
Process	0.81	1.02
Readmissions	0.95	1.03
Mortality	0.96	1.05
Congestive Heart Failure (CHF)		
Process	0.67	1.06
Readmissions	0.96	1.05
Mortality	0.97	1.02

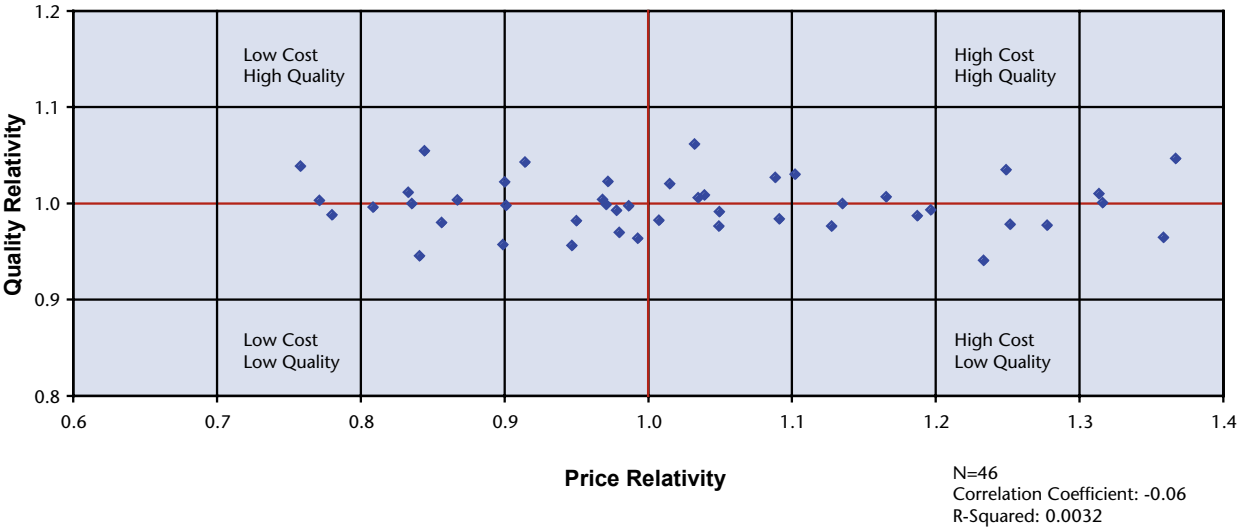
[1] The quality relativity was computed by dividing the hospital's performance rate by the statewide average. A relativity of 1.0 is average, and higher numbers indicate better performance. A relativity of 1.10, for example, indicates that the hospital performs 10% better than average on the measure. The relativities for each quality component were then averaged together, giving an aggregate relativity indicating the weighted-average performance for each hospital for each DRG examined. This aggregate relativity can be used to gauge each hospital's relative performance for each DRG.

The range in quality scores are wider for the individual quality measures within each DRG composite score, however, still reflecting a relatively narrow range in each case. Wider ranges were generally found for the process measures. Specifically, the widest range was found for the congestive heart failure process measures where the lowest hospital score was 33 points lower than the median and the highest was 6 points higher.

Aggregate Relationship between Quality and Price for 14 Inpatient DRGs in Massachusetts Hospitals

Figure 8 is a scatter plot depicting the relationship between price relativities and quality relativities for vaginal delivery (DRG 560). While price relativities range from a low of 0.76 (or 24 percent below the median) to a high of 1.37 (37 percent above the median), quality relativities for this DRG are tightly grouped around 1.0, with some higher priced hospitals having quality relativities slightly below 1.0 and some lower priced hospitals with quality relativities slightly above 1.0. Similar graphics for the additional DRGs are located in Figures 1.1 through 1.14 in the *Statistical Appendix*. Price and quality relativity correlation coefficients, listed at the bottom of each graph, suggest little correlation for any of the selected DRGs.

Figure 8: Price vs. Quality for Vaginal Delivery (DRG 560)

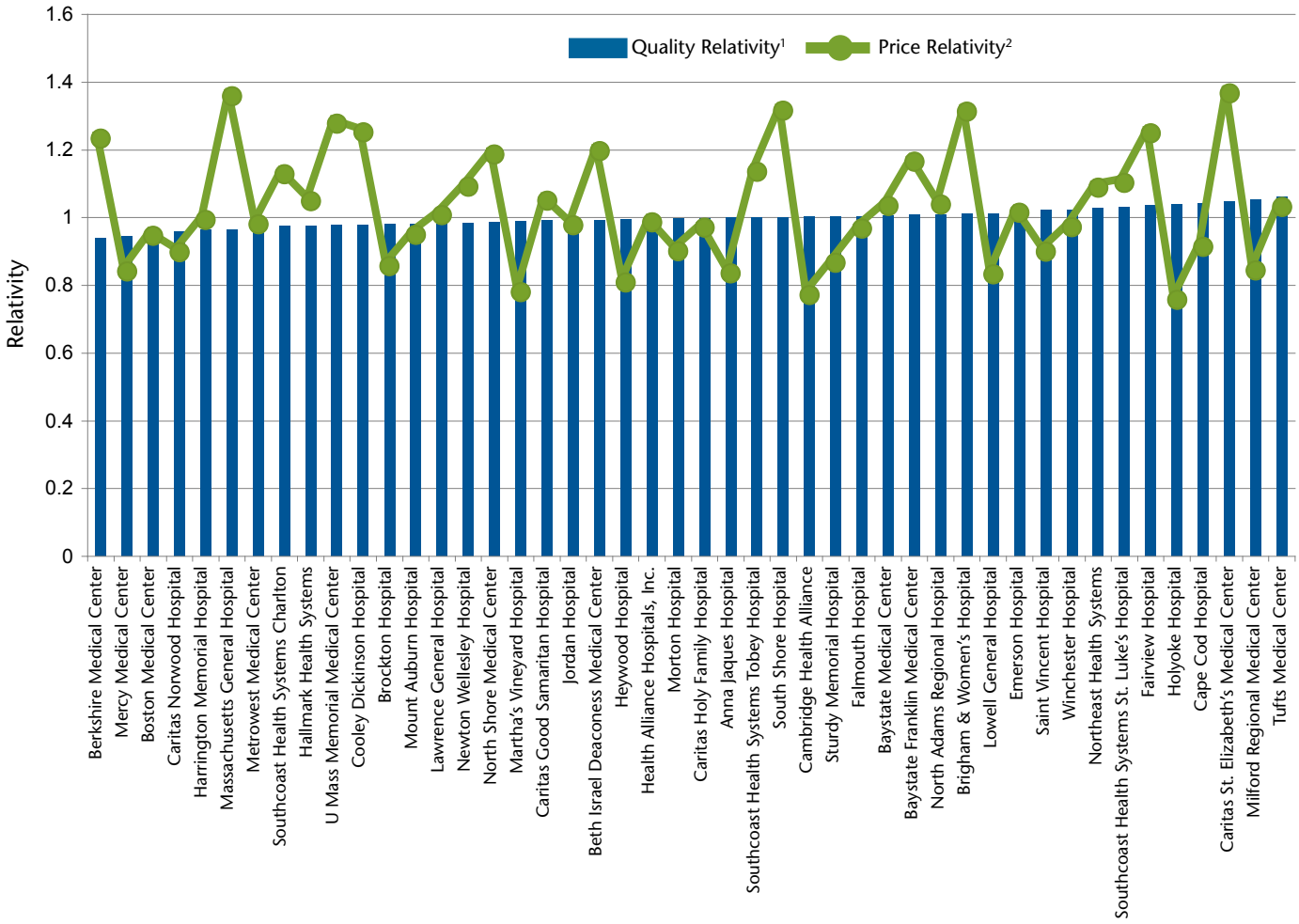


Note: A correlation coefficient is a measure of how well two variables match each other. Values of a correlation coefficient range from -1 to 1. R-squared is the square of the correlation coefficient, indicating the extent of the variation in one variable that is related to the variation in the other. Values for r-squared range from 0 to 1.

Price and Quality Relationship by Hospital

Figure 9 provides both the quality relativity and the price relativity for each hospital for vaginal delivery (DRG 560). Hospitals listed in the figure are ordered from lowest to highest quality, but due to the narrowness of the range, there may not necessarily be a meaningful difference in quality between hospitals at either end of the range. The figure illustrates two findings: there is significant variation in the price paid for the 14 DRGs, and price does not relate in a consistent manner to quality. For instance, Berkshire Medical Center and Massachusetts General Hospital with price relativities of 1.23 and 1.36, respectively, have composite quality relativities that are slightly less than 1.0, while Holyoke Hospital and Milford Regional Medical Center have significantly lower price relativities of 0.76 and 0.84, respectively, with composite quality relativities that are slightly above 1.0. Similar graphics for each of the remaining DRGs are presented in the *Statistical Appendix* Figures 2.1 through 2.14. In every case, there is a significant variation in price that does not relate in any consistent manner to quality (Tables 5.1 through 5.14 in the *Statistical Appendix.)*

Figure 9: Quality Relativity and Price Relativity for Vaginal Delivery (DRG 560) by Hospital



[1] The quality relativity is each hospital's composite quality score for the given DRG as it relates to the statewide average composite quality score.

[2] The price relativity is the hospital's severity adjusted median price for the given DRG as it relates to the severity adjusted price of the median hospital listed.

See the *Technical Appendix* for further detail on these calculations.

Other Factors that May Explain Hospital Inpatient Price Differences

It is important to note that several factors may influence price variation. Commonly cited reasons include hospital teaching status, capacity to provide specialized care, cost structure, costs of living related to geographic location, labor costs, payer mix, case mix, and market power. The analysis in this report addresses, in part, issues of case mix through the severity adjustments and payer mix through the analysis of private payer to public payer prices.

Given that hospitals differ in many respects, some amount of price variation should be expected. Medicare fee schedule rates, and Medicaid to a lesser extent, explicitly account for some of the aforementioned factors including geographic variation in wages, teaching status, and disproportionate share status. The variation associated with these factors results in a range in prices that is similar in breadth to the range found in this report's analysis of private payer prices. However, the relative rankings of hospitals are not similar across Medicare and private payer. Hospitals that receive higher payments from Medicare are not necessarily the same hospitals that receive higher payments from commercial carriers, suggesting that factors other than what Medicare considers are influencing private payer prices.

Identifying which factors should be considered in price differentials across hospitals would help in determining the appropriate scope of price variation across providers. As noted earlier, the Special Commission of Provider Price Reform will allow for further discussion and more detailed exploration of this issue.

Section 2: Professional Services

Section 2.1: State-Wide Variation in Physician and Professional Services

Method: Twenty current procedural terminology (CPT) codes, representing a large volume of payments and diverse types of service, were selected for analysis. The 20 identified CPT codes represent the highest volume of procedures within five major service categories: evaluation and management (4 CPT codes), general medicine (3 CPT codes), physical medicine (3 CPT codes), radiology (4 CPT codes), and surgery (6 CPT codes). These 20 CPT codes accounted for $905.8 million in payments to professionals in 2009, or about 28 percent of all fee-for-service payments for professional services among the carriers included in this study (Table 21). The analysis throughout this section is based on the statewide distribution of all payments made for each CPT code, since the available data did not allow for the identification of individual physicians or other providers submitting professional claims. While payments for professional claims are actual prices unadjusted for patient severity, a severity adjustment calculation is unnecessary in this context, as the CPT codes are defined at a more detailed level than the analyzed DRGs.

Table 21: Total Payments for Selected High-Volume Physician and Professional Services, and as a Percent of All Payments for Professional Services, 2009 (continued on next page)

Service type and CPT Code	Total services (in thousands)	Percent of total professional services	Total payments ($ millions)	Percent of total payments for professional services
Total, all selected services	9,086.9	28.3	$905.8	27.4
Evaluation and management				
Office/outpatient visit, established patient, low complexity (99213)	2,881.6	9.0	$274.3	8.3
Office/outpatient visit, established patient, moderate complexity (99214)	1,338.5	4.2	$188.9	5.7
Preventive visit, established patient 40-64 years of age (99396)	385.2	1.2	$60.1	1.8
Office/outpatient visit, new or established patient, moderate complexity (99244)	180.2	0.6	$53.7	1.6
General medicine				
Office-based psychotherapy visit (90806)	1,139.8	3.5	$102.7	3.1
Comprehensive eye examination (92014)	245.4	0.8	$31.3	0.9
Office-based psychotherapy visit, with medical evaluation and management services (90807)	186.3	0.6	$25.4	0.8
Physical medicine				
Therapeutic exercises (97110)	1,074.8	3.3	$26.7	0.8
Manual therapy, one or more regions (97140)	578.3	1.8	$12.3	0.4
Chiropractic manipulation treatment, spinal, 1-2 regions (98940)	547.7	1.7	$17.8	0.5

Source: Mathematica Policy Research analysis of private insured and self-insured fee-for-service claims for Massachusetts residents.

Note: Payments include patient cost-sharing in fee-for-service coverage. Payments made under managed care contracts are not included.

Table 21: Total Payments for Selected High-Volume Physician and Professional Services, and as a Percent of All Payments for Professional Services, 2009 (continued from previous page)

Service type and CPT Code	Total services (in thousands)	Percent of total professional services	Total payments ($ millions)	Percent of total payments for professional services
Radiology				
MRI brain without and with contrast (70553)	24.5	0.1	$5.8	0.2
MRI, any joint of lower extremity; without contrast (73721)	32.2	0.1	$4.1	0.1
CT Abdomen with contrast (74160)	54.7	0.2	$6.6	0.2
Radiologic examination, chest-frontal and lateral views (71020)	236.5	0.7	$5.0	0.2
Surgery				
Routine maternity care including vaginal delivery (59400)	13.1	0.0	$43.1	1.3
Colonoscopy (45378)	35.8	0.1	$19.1	0.6
Upper gastrointestinal endoscopy with biopsy, single or multiple (43239)	25.4	0.1	$11.5	0.3
Biopsy of skin, subcutaneous tissue and/or mucous membrane (11100)	44.0	0.1	$6.1	0.2
Arthrocentesis, aspiration and/or injection, major joint (20610)	57.1	0.2	$6.0	0.2
Arthroscopic partial or total resection of medial or lateral meniscus (29881)	5.7	0.0	$5.4	0.2

Source: Mathematica Policy Research analysis of private insured and self-insured fee-for-service claims for Massachusetts residents.

Note: Payments include patient cost-sharing in fee-for-service coverage. Payments made under managed care contracts are not included.

The distribution of payments for each of the 20 CPT codes examined for this section was generally concentrated toward higher prices, although not for all of the selected services. For three services, chiropractic manipulation (CPT code 98940), colonoscopy (CPT code 45378), and upper gastrointestinal endoscopy (CPT code 43239), prices were slightly skewed downward (Table 22).

Table 22: Minimum, Median, Mean and Maximum Prices for Selected High-Volume Physician and Professional Services, 2009

Service type and CPT Code	Minimum price	Median price	Average price	Maximum price	Difference between maximum and minimum price	Ratio of maximum to minimum price
Evaluation and management						
Office/outpatient visit, established patient, low complexity (99213)	$40	$84	$95	$320	$280	8.0
Office/outpatient visit, established patient, moderate complexity (99214)	$45	$127	$141	$330	$285	7.4
Preventive visit, established patient 40-64 years of age (99396)	$80	$139	$156	$347	$267	4.3
Office/outpatient visit, new or established patient, moderate complexity (99244)	$132	$249	$298	$984	$852	7.5
General medicine						
Office-based psychotherapy visit (90806)	$48	$81	$90	$255	$207	5.3
Comprehensive eye examination (92014)	$48	$123	$128	$320	$272	6.7
Office-based psychotherapy visit, with medical evaluation and management services (90807)	$48	$124	$136	$360	$312	7.5
Physical medicine						
Therapeutic exercises (97110)	$14	$20	$25	$78	$64	5.4
Manual therapy, one or more regions (97140)	$9	$18	$21	$72	$63	7.6
Chiropractic manipulation treatment, spinal, 1-2 regions (98940)	$19	$33	$32	$56	$37	2.9
Radiology						
MRI brain without and with contrast (70553)	$104	$219	$236	$646	$542	6.2
MRI, any joint of lower extremity; without contrast (73721)	$60	$112	$127	$444	$384	7.4
CT Abdomen with contrast (74160)	$56	$106	$120	$296	$240	5.2
Radiologic examination, chest-frontal and lateral views (71020)	$10	$18	$21	$71	$62	7.5
Surgery						
Routine maternity care including vaginal delivery (59400)	$1,590	$2,936	$3,294	$6,401	$4,811	4.0
Colonoscopy (45378)	$203	$546	$533	$1,045	$842	5.1
Upper gastrointestinal endoscopy with biopsy, single or multiple (43239)	$85	$486	$451	$1,000	$915	11.8
Biopsy of skin, subcutaneous tissue and/or mucous membrane (11100)	$40	$132	$139	$335	$295	8.4
Arthrocentesis, aspiration and/or injection, major joint (20610)	$39	$99	$105	$311	$272	8.0
Arthroscopic partial or total resection of medial or lateral meniscus (29881)	$329	$830	$934	$2,057	$1,727	6.2

Source: Mathematica Policy Research analysis of private insured and self-insured fee-for-service claims for Massachusetts residents.

Note: Payments include patient cost-sharing in fee-for-service coverage. Payments made under managed care contracts are not included.

For most but not all of the services examined, there was significant variation in the prices paid. The difference between the maximum and minimum payments was just $37 for chiropractic manipulation treatment (CPT code 98940), but spanned $4,811 for routine maternity care (CPT code 59400) (Table 22). Even when the dollar differences were small, however, the percentage differences were generally high. The ratio of the maximum to the minimum price paid ranged from 2.9 for chiropractic manipulation treatment (CPT code 98940; $19 minimum and $56 maximum) to 11.8 for upper gastrointestinal endoscopy with biopsy (CPT code 43239; $85 minimum and $1,000 maximum). Other CPT codes with at least an eight-fold difference in payment amounts included low-complexity evaluation and management (CPT code 99214; $40 minimum and $320 maximum), biopsy of the skin, subcutaneous tissue and /or mucous membrane (CPT code 11100; $40 minimum and $335 maximum), and arthrocentesis, aspiration and /or injection of a major joint (CPT code 20610; $39 minimum and $311 maximum).

Section 2.2. Private Payer Prices Compared to Medicaid and Medicare for Physician and Professional Services

Method: 2009 private payer prices for physician and professional services were compared to Medicaid and Medicare using their respective 2009 fee schedule rates. Medicare rates are published online from the Medicare Payment Advisory Commission. Medicare prices were obtained by averaging the 2009 list prices for two Medicare localities: metropolitan Boston (locality code 3314301) and rest of Massachusetts (locality code 3314399). Unless otherwise noted, Medicaid rates are those paid to physicians pursuant to 114.3 CMR 16.00, 17.00, and 18.00, effective 12/1/2008 through 12/31/2010. For physical medicine procedures, the Medicaid prices are those paid to rehabilitation professionals, the rate for chiropractors is that specifically for chiropractors performing the service, and the ophthalmological service rate is that for an ophthalmologist. The private payer rate is for all providers billing the services, however, they are mainly for those same provider types.

For each of the sample services, the private prices are higher than the Medicaid prices, ranging from 12 percent higher for individual psychotherapy to as much as 150 percent higher for ophthalmological services (Table 23).

Private payer prices are also generally higher than Medicare rates, ranging from just 8 percent higher for ophthalmological services to as much as 72 percent higher for the professional component of a brain MRI. In a few instances, namely individual psychotherapy and physical medicine procedures, the private payer price was lower than that paid by Medicare.

Table 23: Private, Medicare, and Medicaid Prices for Professional Procedures (CPT Codes)

CPT Code	CPT Description[1]	Private Payer Median Price	Medicare Fee Schedule Rate[2]	Private Payer Median Price as a % of Medicare Rate	Medicaid Fee Schedule Rate[3]	Private Payer Median Price as a % of Medicaid Rate
Category of CPT Code: Evaluation & Management						
99213	Office or other outpatient visit; established patient; expanded problem focused history; low complexity	$84.37	$67.03	126%	$48.67	173%
99214	Office or other outpatient visit; established patient, detailed history; moderate complexity.	$126.54	$100.63	126%	$73.71	172%
99396	Periodic comprehensive preventive medicine reevaluation; Established patient, ages 40-64 years	$138.55	N/A[4]	N/A[4]	$81.13	171%
99244	Office consultation for a new or established patient, comprehensive history or exam; moderate complexity.	$249.09	$198.72	125%	$145.82	171%
Category of CPT Code: General Medicine						
90806	Individual psychotherapy, 45 to 50 minutes face-to-face	$81.39	$98.73	82%	$72.79	112%
92014	Ophthalmological services: medical examination and evaluation, established patient[5]	$123.24	$113.91	108%	$49.38	250%
90807	Individual psychotherapy, 45 to 50 minutes face-to-face; with medical evaluation and management services	$124.23	$111.10	112%	$78.65	158%
Category of CPT Code: Physical Medicine						
97110	Therapeutic procedure, one or more areas, each 16 minutes[6]	$19.59	$30.48	64%	$13.04	150%
97140	Manual Therapy[6]	$18.26	$28.17	65%	$13.04	140%
98940	Chiropractic manipulation[7]	$32.79	$26.31	125%	$24.67	133%
Category of CPT Code: Radiology						
70553	MRI Brain with and without contrast	$218.61	127.01	172%	$90.58	241%
73721	MRI, joint of lower extremity, without contrast	$111.56	72.40	154%	$51.91	215%
74160	CT Abdomen with contrast	$106.42	69.04	154%	$49.08	217%
71020	Radiologic Examination, chest	$18.20	11.82	154%	$8.46	215%
Category of CPT Code: Surgery						
59400	Routine maternity care including vaginal delivery	$2,936.39	$1,771.39	166%	$2,045.18	144%
45378	Colonoscopy	$546.25	$413.48	132%	$307.89	177%
43239	Upper gastrointestinal endoscopy with biopsy	$485.98	$365.17	133%	$270.59	180%
11100	Biopsy of skin	$132.00	$104.49	126%	$68.40	193%
20610	Arthrocentesis, aspiration, major joint	$98.65	$76.99	128%	$55.63	177%
29881	Arthroscopic partial or total resection of meniscus	$830.00	$631.32	131%	$481.07	173%

[1] For more detailed description of a CPT code, please see Current Procedural Terminology Professional Edition 2010, American Medical Association.

[2] The prices shown are a simple average of the list prices for two Medicare localities: Metropolitan Boston (locality code 3314301) and Rest of Massachusetts (locality code 3314399) for 2009.

[3] Unless otherwise noted, Medicaid rates are those paid to physicians pursuant to 114.3 CMR 16.00, 17.00, and 18.00, effective 12/1/2008 through 12/31/2010.

[4] Medicare does not price this CPT code.

[5] Medicaid rate paid to ophthalmologists (114.3 CMR 15.00). Private pay rate is across all providers but heavily weighted to ophthalmologists.

[6] Medicaid rate paid to rehabilitation clinics and restorative therapists (114.3 CMR 39.00). Private pay rate is as paid to all providers but is heavily weighted to physical therapists.

[7] Medicaid rate paid to chiropractors (114.3 CMR 28.00). Private pay rate is across all providers but heavily weighted to chiropractors.

2.3 Potential Models of Reduced Price Variation

Method: The scenarios modeled here and the underlying distributions are based on the statewide distribution of actual payments made for each CPT code. Modifiers are used to identify the professional components. Since this analysis only uses a sample of CPT codes to estimate percentage savings, the total dollar savings are extrapolated based on data from the 2010 Cost Trends report.[33] That report showed that physician and professional services accounted for 32 percent of total private payer expenditures in 2008 and that total expenditures for the carriers included was $13 billion. These carriers represented 65 percent of the market. Inflating $13 billion to 100 percent of the market yields estimated total private payer expenditures of $20 billion, of which the physician and professional services would account for $6.4 billion. See the Technical Appendix for more detail on how these estimates were derived.

Potential Savings Simulations

Several simulations of reduced price variation were conducted to understand the potential impact on health care spending. Specifically, the analysis considered four models for each of the selected CPT codes:

- Payments were paid at the 2009 median price;
- All payments above the existing 80th percentile were instead made at the 80th percentile;
- The range of payments were narrowed to the existing 20th percentile and 80th percentile; and
- Payments below the existing 20th percentile were instead made at the 20th percentile.

Modeling all private payer prices for professional services at the median payment would have the greatest impact on payments, reducing spending for the selected CPT codes collectively by about 10 percent or an estimated $640 million in total. Only for those services in which the distribution of prices was downward-skewed, such as chiropractic manipulation treatment (CPT code 98940), colonoscopy (45378), and upper gastrointestinal endoscopy (43239), would payments increase if all providers were paid the median price.

If the upper-end of payments (those above the 80th percentile) were made instead at the 80th percentile, it would reduce spending by about half that amount or 5 percent (Table 24). Narrowing the range in price variation between the 20th and 80th percentiles (by increasing the lowest prices and reducing the highest prices) would reduce total payments by almost 3 percent, an estimated $179 million in total savings. Alternatively, if the lower-end of payments were increased to the 20th percentile without a corresponding decrease in upper-end payments, the impact would be an increase of 2.2 percent or $138 million.

33 Massachusetts Division of Health Care Finance and Policy, *Massachusetts Health Care Cost Trends, Part III: Health Spending Trends for Privately Insured 2006-2008, Technical Report*, February 2010. Available at: http://www.mass.gov/Eeohhs2/docs/dhcfp/r/cost_trends_files/part3_health_spending_trends_technical_report.pdf, accessed 5/22/2011.

Table 24: Total Payments for Selected High-Volume Physician and Professional Services and Simulated Change with Alternative Payment Levels, 2009

Service type and CPT Code	All payments made at the median	Payments above the 80th percentile reduced to the 80th percentile	All payments made between the 20th and 80th percentile	Payments below the 20th percentile increased to the 20th percentile
Total, all selected services				
Percent change	-10.4%	-5.0%	-2.8%	2.2%
Evaluation and management				
Office/outpatient visit, established patient, low complexity (99213)	-11.4%	-5.0%	-2.4%	2.6%
Office/outpatient visit, established patient, moderate complexity (99214)	-10.3%	-3.4%	-0.7%	2.7%
Preventive visit, established patient 40-64 years of age (99396)	-11.2%	-2.2%	-1.0%	1.2%
Office/outpatient visit, new or established patient, moderate complexity (99244)	-16.5%	-9.8%	-7.8%	1.9%
General medicine				
Office-based psychotherapy visit (90806)	-9.7%	-6.5%	-5.9%	0.6%
Comprehensive eye examination (92014)	-3.5%	-4.6%	-1.7%	2.9%
Office-based psychotherapy visit, with medical evaluation and management services (90807)	-8.8%	-6.9%	-3.9%	3.1%
Physical medicine				
Therapeutic exercises (97110)	-21.2%	-11.8%	-11.5%	0.3%
Manual therapy, one or more regions (97140)	-14.4%	-13.2%	-13.0%	0.2%
Chiropractic manipulation treatment, spinal, 1-2 regions (98940)	1.0%	-0.5%	1.0%	1.6%
Radiology				
MRI brain without and with contrast (70553)	-7.5%	-4.6%	-3.2%	1.4%
MRI, any joint of lower extremity; without contrast (73721)	-12.5%	-5.5%	-4.0%	1.5%
CT Abdomen with contrast (74160)	-11.6%	-2.0%	0.3%	2.2%
Radiologic examination, chest-frontal and lateral views (71020)	-13.2%	-6.8%	-5.0%	1.8%
Surgery				
Routine maternity care including vaginal delivery (59400)	-10.8%	-1.8%	0.6%	2.4%
Colonoscopy (45378)	2.5%	-3.8%	-1.2%	2.6%
Upper gastrointestinal endoscopy with biopsy, single or multiple (43239)	7.7%	-2.8%	-0.4%	2.4%
Biopsy of skin, subcutaneous tissue and/or mucous membrane (11100)	-5.0%	-4.1%	-0.1%	4.0%
Arthrocentesis, aspiration and/or injection, major joint (20610)	-6.2%	-4.6%	-1.2%	3.3%
Arthroscopic partial or total resection of medial or lateral meniscus (29881)	-11.2%	-3.9%	-1.5%	2.4%

Source: Mathematica Policy Research analysis of private insured and self-insured fee-for-service claims for Massachusetts residents.

Note: Payments include patient cost-sharing in fee-for-service coverage. Payments made under managed care contracts are not included. Savings here represent savings for physician and professional services only, which represented approximately 32% of total private payer healthcare expenditures in 2008, as reported in *Massachusetts Health Care Cost Trends, Part III: Health Spending Trends for Privately Insured 2006-2008, Technical Report* (February 2010).

Section 3: Hospital Outpatient Services

This section provides a limited analysis of price variation among hospital outpatient services, since outpatient services do not conform to a single well-defined standard unit of service. Future analyses may seek to examine hospital outpatient service costs and utilization.

Four reasonably standardized procedure codes were selected as a demonstration of price variation. These services, however, are not generally representative of hospital outpatient services and account for just over 1 percent of total outpatient services and approximately 5 percent of total fee-for-service payments for hospital outpatient services ($141.7 million) among the carriers included in the study (Table 25). The selected services included colonoscopy (CPT code 45378), computerized tomography, pelvis (CPT code 72193), radiation oncology, intensity modulated treatment delivery (CPT code 77418), and digital screening mammography (HCPCs code G0202).

Table 25: Total Payments for Selected Hospital Outpatient Services, and as a Percent of All Payments for Outpatient Services, 2009

Service type and CPT Code	Total services (in thousands)	Percent of total outpatient services	Total payments ($ millions)	Percent of total payments for outpatient services
Total, all selected services	263.6	1.3%	$141.7	5.0%
Colonoscopy (45378)	31.9	0.2%	$38.5	1.4%
Computed tomography, pelvis (72193)	27.6	0.1%	$19.2	0.7%
Intensity modulated treatment delivery - radiation oncology (77418)	26.6	0.1%	$37.2	1.3%
Mammogram (G0202)	177.4	0.9%	$46.8	1.7%

Source: Mathematica Policy Research analysis of private insured and self-insured fee-for-service claims for Massachusetts residents.

Note: Payments include patient cost-sharing in fee-for-service coverage. Payments made under managed care contracts are not included.

Similar to the selected physician and professional services, no one service accounted for a large share of all outpatient services. Colonoscopies accounted for 0.2 percent of all procedures and 1.4 percent of outpatient fee-for-service payments, while the CPT codes related to computerized tomography, radiation oncology, and mammography each accounted for less than 1 percent of procedures and less than 2 percent of outpatient fee-for-service payments.

Payments for each of the selected procedures were normally distributed with similar mean and median payments. For example, the mean and median payments for digital screening mammography were $264 and $269, respectively (Table 26). However, the range of prices paid was substantial, spanning $417 for screening mammography ($93 minimum and $509 maximum) and $3,457 for radiation oncology procedures ($339 minimum and $3457 maximum). The percent variation in maximum and minimum prices was approximately 600 percent for digital screening mammography, computerized tomography, and colonoscopy procedures, but more than 1,000 percent for the radiation oncology procedure code.

Table 26: Minimum, Median, Mean and Maximum Prices for Selected Hospital Outpatient Services, 2009

Service type and CPT Code	Minimum price	Median price	Average price	Maximum price	Difference between maximum and minimum price	Ratio of maximum to minimum price
Colonoscopy (45378)	$425	$1,185	$1,204	$2,570	$2,145	6.0
Computed tomography, pelvis (72193)	$316	$637	$695	$1,797	$1,481	5.7
Intensity modulated treatment delivery - radiation oncology (77418)	$339	$1,266	$1,400	$3,457	$3,118	10.2
Mammogram (G0202)	$93	$269	$264	$509	$417	5.5

Source: Mathematica Policy Research analysis of private insured and self-insured fee-for-service claims for Massachusetts residents.

Note: Payments include patient cost-sharing in fee-for-service coverage. Payments made under managed care contracts are not included.

Potential savings scenarios were modeled for these hospital outpatient services to understand the impact of reduced price variation on outpatient care spending (Table 27). Since this analysis is not as robust and the studied services do not cover a significant proportion of the outpatient dollars, only savings potential for each of the identified service codes are provided. There is no extrapolation to total system savings. Outpatient services represent 23 percent of total private payer spending.[34]

Table 27: Total Payments for Selected Hospital Outpatient Services and Simulated Change with Alternative Payment Levels, 2009

Service type and CPT Code	Simulated change in payments, with: All payments made at the median	Payments above the 80th percentile reduced to the 80th percentile	All payments made between the 20th and 80th percentile	Payments below the 20th percentile increased to the 20th percentile
Total, all selected services				
Percent change in payments	-3.4%	-4.2%	-1.7%	2.5%
Colonoscopy (45378)	-1.6%	-4.5%	-1.7%	2.9%
Computed tomography, pelvis (72193)	-8.5%	-4.6%	-2.5%	2.1%
Intensity modulated treatment delivery-radiation oncology (77418)	-9.5%	-5.5%	-3.1%	2.4%
Mammogram (G0202)	2.0%	-2.7%	-0.2%	2.5%

Source: Mathematica Policy Research analysis of private insured and self-insured fee-for-service claims for Massachusetts residents.

Note: Payments include patient cost-sharing in fee-for-service coverage. Payments made under managed care contracts are not included.

34 Massachusetts Division of Health Care Finance and Policy, *Massachusetts Health Care Cost Trends, Part III: Health Spending Trends for Privately Insured 2006-2008*, February 2010. Available at: http://www.mass.gov/Eeohhs2/docs/dhcfp/r/cost_trends_files/part3_exec_sum_health_spending_trends.pdf, accessed 5/22/2011.

Conclusion

In this report, DHCFP seeks to expand the understanding of price variation for hospitals and other professional services for a sample of health care services in three service categories: inpatient hospital care; outpatient hospital care; and physician and other professional services. These analyses are intended to promote transparency of differences in health care payments as well as inform ongoing policy discussions regarding approaches to mitigate rising health care costs. Any strategies to increase the efficiency of the Commonwealth's health care system must ensure the viability of efficient, low-cost providers in the marketplace, prioritize their role in an integrated health care delivery system, and establish them as key "building blocks" in a transition toward payment reform.

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